

# **Source Water Assessment of the United Water Delaware Public Water Supply Intake Located on the Christina River at Smalleys Pond**

May 2002



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## **FOREWORD**

This Source Water Assessment Report for the United Water Delaware public water supply intake on the Christina River at Smalleys Pond was prepared by the University of Delaware, Institute for Public Administration – Water Resources Agency by contractual agreement with the Delaware Department of Natural Resources and Environmental Control, Division of Water Resources. The UDWRA prepared the report utilizing best professional judgment in accordance with methodology established in the October 1999 State of Delaware Source Water Assessment Plan and supplemented by the policies prescribed by the DNREC with concurrence by the SWAPP Citizen and Technical Advisory Committee.

This SWAPP assessment was prepared by Martin Wollaston and Jerry Kauffman, assisted by the following UDWRA staff and students: Nicole Minni, Vern Svatos, Justin Bower, Scott Smizik, Martha Corrozi, and Arthur Jenkins.

# **Source Water Assessment of the United Water Delaware Public Water Supply Intake located on the Christina River at Smalleys Pond, Delaware**

## **Chapter 1: Introduction**

### **1.1 Background of SWAPP**

In 1996 the U.S. Congress amended the Safe Drinking Water Act (SDWA) establishing a Source Water Assessment and Protection Program (SWAPP). The program, coordinated nationally by the U.S. Environmental Protection Agency (EPA), requires all states to develop a plan for evaluating the drinking water supply sources used by public water systems in their state and then follow the plan to conduct source water susceptibility assessments. Susceptibility assessments will include a determination of the area that has the greatest affect on the quality of each public drinking water source and an inventory of the potential contaminants within the designated area. The ultimate goal of the SWAPP is to provide local government the information it needs to improve the protection of public drinking water sources through its land management authority.

It should be recognized that for many years the primary mechanism for insuring the safety and quality of our drinking water has been water treatment facilities. Public water suppliers have spent billions of dollars developing sophisticated water treatment techniques that remove materials that are harmful to our health. The SWAPP will add another protective mechanism to safeguard our drinking water supplies by identifying the potential sources of contamination that may affect raw water quality and providing assistance in managing or eliminating these potential contaminant sources.

In October 1999 the U.S. EPA formally approved Delaware's Source Water Assessment Plan which outlined the methodology Delaware will follow to determine the susceptibility of the 582 public water systems in the state. All assessments will follow the same general approach, although the details may vary depending on the size of the water system.

#### ***1. Delineate the source water areas for each intake (watershed) or well (wellhead).***

Initially, the area most important to water quality for each public system will be mapped. For surface water, the watershed area upstream of the intake will be examined, with particular attention focused on areas adjacent to streams and tributaries. For ground water, the source water delineated area will be either a fixed radius of 150 feet (300 feet in New Castle County) surrounding the well or an area determined by ground water modeling.

#### ***2. Determine the vulnerability of each intake or well to contamination.***

Second, the vulnerability of the surface water intake or well will be determined using a decision-making chart developed in Delaware's source water plan. Vulnerability is defined as the relative ease with which contaminants, if released within a source water area, could move and enter a public water supply well or intake at concentrations of concern.



**3. *Identify existing and potential sources of contamination in the source water area.***

Third, an inventory of all documented existing and potential sources of contamination from discrete sources within these delineated areas will be developed. The land use within these areas will also be assessed for potential non-point sources of pollution.

**4. *Determine the susceptibility of the source water area to contamination.***

And the last step will be to examine water quality test data from the previous 10 years. This sampling data will be supplemented by water quality tests that were conducted in August 2001 by the State as part of a special water quality investigation of drinking water supplies.

All of this information will be evaluated and distilled into a ranking of susceptibility based on the methodology and matrix developed by the SWAPP Citizen and Technical Advisory Committee. Susceptibility will be reported for eight categories of contaminants, as follows:

- Nutrients (nitrate, etc.)
- Pathogens (bacteria, cryptosporidium, giardia, etc.)
- Petroleum Hydrocarbons (benzene, toluene, etc.)
- Pesticides (endrin, lindane, etc.)
- Polychlorinated biphenyls (PCBs)
- Other Organics (chloroform, etc.)
- Metals (lead, copper, zinc, etc.)
- Other Inorganics (chloride, sodium, etc.)

The University of Delaware, Institute for Public Administration, Water Resources Agency, under an agreement with the Delaware Department of Natural Resources and Environmental Control (DNREC), completed the following source water assessment of the United Water Delaware Public Water Supply Intake Located on the Christina River at Smalleys Pond in Christiana, Delaware (hereafter called United Water Delaware at Smalleys Pond).

## **1.2 UWD at Christiana Public Water Supply System**

### **Background**

In 1933, the Wilmington Suburban Water Corporation (WSWC) was formed to provide public water supply to customers in New Castle County. In 1994 United Water Resources, the second largest investor-owned water services company in the United States, purchased the WSWC and named this subsidiary of the company United Water Delaware (UWD). Through the years, UWD has operated two surface water treatment facilities to provide public water supply – a 30 million gallon a day (mgd) facility at the confluence of the White Clay/Red Clay Creeks at Stanton, Delaware and a 6 mgd facility in Christiana, Delaware located on the Christina River at Smalleys Pond. UWD serves residential, commercial, and industrial customers within a service area that stretches from the Pennsylvania state line in northeast New Castle County to the northern edge of the Chesapeake & Delaware Canal.

## Water Treatment Facility

United Water Delaware operates two surface water treatment facilities. The Christiana Water Treatment Plant is the focus of this SWAPP report. It provides drinking water to the UWD southern service area that extends from Interstate Route I-95 south to the Chesapeake and Delaware Canal. The Christiana Water Treatment Plant uses conventional treatment, dual media filtration, and chlorine to disinfect water withdrawn from Smalleys Pond on the Christina River. The Christiana WTP is allocated by the Delaware DNREC to withdraw and treat 6 mgd. Raw water is withdrawn from Smalleys Pond that has a usable storage volume of 40 million gallons.

It is important to emphasize that a major advantage surface water treatment facilities have over ground water systems is that the intake can be closed to prevent contaminants from acute incidences from entering the treatment facility when advanced notification is provided. Since it is a dynamic system, once the pollutant flows past the intake it can be reopened to resume normal operations.

**Table 1: Characteristics of United Water Delaware's Water Supply System**

Characteristic	Description
System	Circa 1933
Source Waters for Christiana Facility	Surface – Christina River at Smalleys Pond
Christiana WTP Original Construction	1926
Christiana WTP Modernization	Currently In Study Phase
Treatment	Conventional Treatment, Dual Media Filtration, and Chlorination
Storage	17 Finished Water Storage Tanks (31 mg)
Mains	501 miles
Service Population	103,800
Service Area	55 sq. miles
Christiana WTP Capacity	Normal Production – 2.5 mgd Peak Production – 2.8 mgd Treatment Capacity – 6 mgd
UWD Total System Demand Year 2000	Normal Demand – 21 mgd Peak Demand – 30.7 mgd Total Treatment Capacity – 36 mgd Total Interconnections – 3 mgd

## Interconnections with Other Public Water Suppliers

United Water Delaware has established interconnections with the water distribution systems of three other public water suppliers in New Castle County – City of Newark, City of Wilmington, and the Artesian Water Company. UWD also has two interconnections with a water supplier in Pennsylvania that is a subsidiary of United Water, United Water Bethel that buys its water from

the Chester Water Authority. The interconnection with United Water Bethel is used on a daily basis to provide water to the Brandywine Hundred area in Delaware. UWD's interconnections with Artesian and Wilmington are used only in emergencies. This assessment will not include an assessment of these other water suppliers, but those assessments will be available from the DNREC and the Pennsylvania Department of Environmental Protection. Table 2 below summarizes these interconnections.

**Table 2: Interconnections with Other Public Water Suppliers**

<b>UWD Interconnections with:</b>	<b>Location</b>	<b>Flow Direction</b>	<b>Capacity (MGD)</b>
Chester Water Authority, PA	Philadelphia Pike	One Way to UWD	0.3
United Water Bethel, PA	Concord Pike	Two Way	1.5
Wilmington	Chatham	Two Way	1.5 to UWD 0.5 to Wilmington
Wilmington	Silverside Road	Two Way	Emergency to UWD 0.5 to Wilmington
Wilmington	35 <sup>th</sup> /Governor Blvd.	One Way to UWD	0.25
Wilmington	Cherry Island	One Way to Wilmington	Emergency
Wilmington	Lambson Lane	One Way to UWD	0.5
Wilmington	Christiana Avenue	Two Way	1.0 to UWD 0.5 to Wilmington
Artesian	Newport Heights	Two Way	3.0
Artesian	Churchmans Rd.	Two Way	2.0
Artesian	First State Industrial Park	Two Way	1.5 to UWD 2.0 to Artesian
Artesian	Red Lion Rd.	Two Way	Emergency
Artesian	Pleasant Valley Rd.	Two Way	1.0 to UWD 0.5 to Artesian
Newark	Academy Street	One Way to Newark	3.0
Newark	Red Mill Rd.	One Way to Newark	1.4
Cecil County, MD	Elkton Rd.	One Way to Elkton	0.4



## Chapter 2: Delineation of Source Water Protection Area

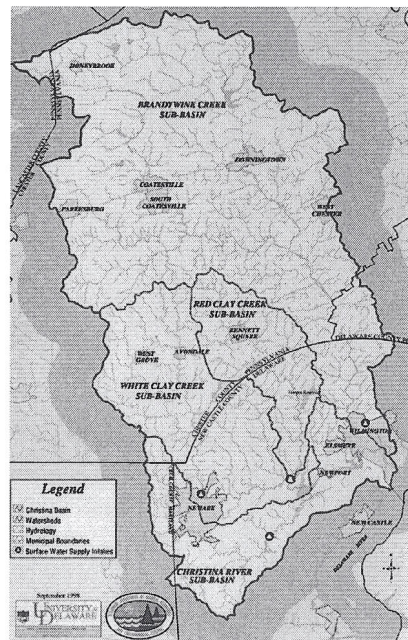
The State of Delaware Source Water Assessment Plan (SWAP), October 1999 describes the methods to be used to delineate the areas that contribute source water to public drinking water supplies. The guidance provided by the U.S. EPA requires a state to examine source water areas only within the state; however, Delaware decided to include the entire watershed upstream of intakes up to the first public intake located on that stream in the other states, Pennsylvania and Maryland. The source water assessments being developed by Pennsylvania and Maryland would cover the areas from that intake upstream. The delineated source water area for the United Water Delaware at Smalleys Pond intake is the Christina River Sub-basin displayed in Figure 1. The map provided in Appendix A entitled "United Water Delaware Christina River at Smalleys Pond Intake Source Water Delineated Area" displays the source water map for the UWD at Smalleys Pond intake in more detail. Including more of the watershed regardless of the state boundaries provides a much better assessment of the potential contaminants that could flow into the source water for Delaware water suppliers.

The University of Delaware Water Resources Agency mapped the boundaries of the Christina River utilizing ARC/INFO GIS from the following data sources:

- Delaware – Digitized from USGS Newark East and Newark West Quadrangles by the Water Resources Agency, 1995.
- Maryland - Digitized from the USGS Newark West Quadrangle by the Water Resources Agency, 1995.
- Pennsylvania – Digitized from Chester County Planning Commission watershed map by the Water Resources Agency, 1995 and confirmed by U.S. Geological Survey digital files, 1997.

A complete listing of all data sources used for the source water assessment maps developed for this assessment is provided on the maps in Appendix A.

**Figure 1: Christina River Basin Delineation**



The Christina River above Smalleys Pond watershed drains about 47 square miles and includes three states - Delaware, Maryland and Pennsylvania. It will be important to coordinate the Delaware SWAP effort with the upstream jurisdictions in Maryland and Pennsylvania. Table 3 describes the characteristics of the Christina River above Smalleys Pond source water area.

**Table 3: Characteristics of the Delineated Source Water Area for the UWD at Smalleys Pond Intake**

Characteristic	Description
Source Water	Christina River/Smalleys Pond
Total Source Water Area	DE 36 sq. mi. (77 %) MD 8 sq. mi. (17%) PA 3 sq. mi. ( 6 %) Total 47 sq. mi. (100 %)
Total Source Water Area Land Use	Urban/Suburban 21 sq. mi. (45 %) Agriculture 9 sq. mi. (19 %) Wooded/Open Space 17 sq. mi. (36 %)
States	Delaware Maryland Pennsylvania
Counties	New Castle County, DE Cecil County, MD Chester County, PA
Municipalities	Newark, DE Elkton, MD London Britain Township, PA Franklin Township, PA

For UWD, the delineated source water area is the entire Christina River above Smalleys Pond watershed upstream of the intake as displayed on the maps in Appendix A. Note that 25% of the source water area for UWD's intake at Smalleys Pond is located within either Maryland or Pennsylvania.

As described in the Delaware SWAP, the delineated source water areas for surface water intakes have been separated into **Level 1** and **Level 2** areas. The **Level 1** areas are the lands closest to the main stream and its tributaries. These lands have the greatest impact on water quality. They include the Level 1A areas defined as the 100-year floodplain and erosion-prone slopes adjacent to the floodplain and the Level 1B areas defined as a buffer area of 200 feet on both sides of the stream. The erosion prone slopes are only designated on the Delaware portion of the watershed and were obtained from the New Castle County Water Resource Protection Area program developed years ago to protect public drinking water sources in New Castle County. The entire watershed area upstream of the intake is labeled as the **Level 2** area. Potential contaminants in the Level 2 area are important to water quality, but their impacts will usually be less than those located in Level 1 areas because of the greater distance they must travel to enter a stream.

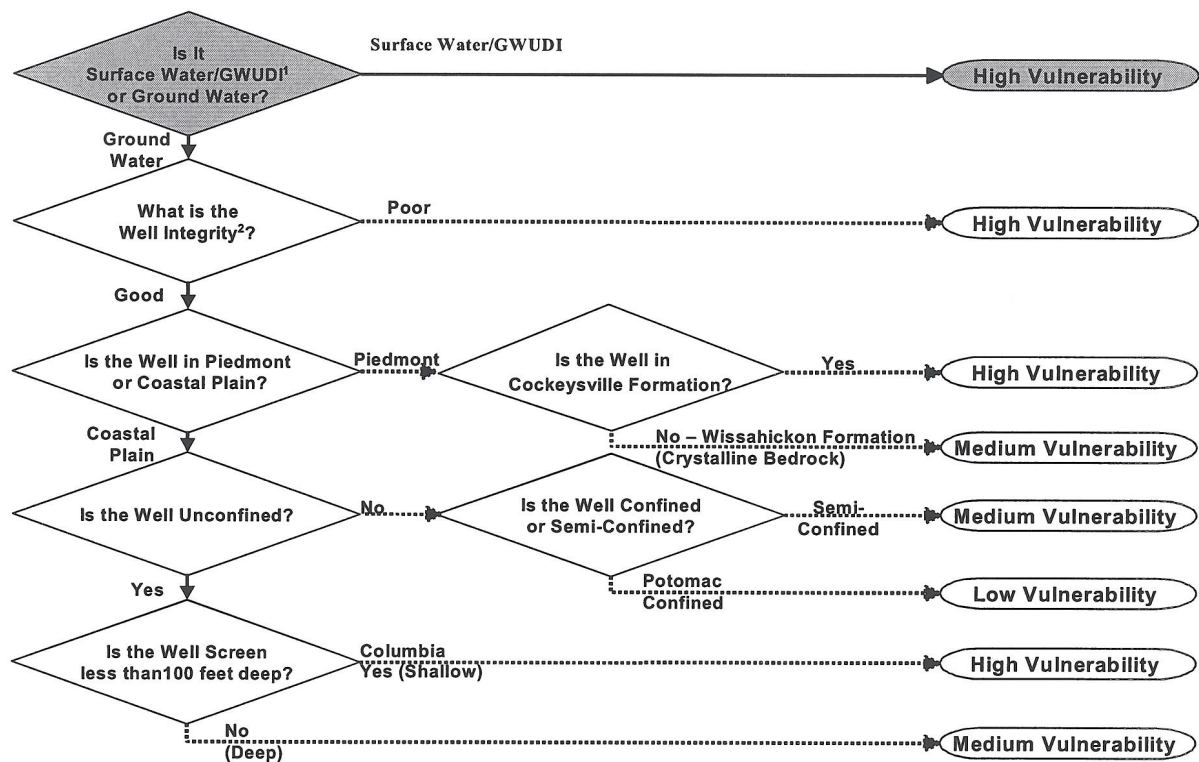


## Chapter 3: Vulnerability Determination

The vulnerability of a public water source is defined as the relative ease with which contaminants, if released into the source water area, could move and enter a surface water intake (or a well for ground water) at concentrations of concern. The vulnerability determination process (Figure 2) is described in the 1999 Delaware Source Water Assessment Plan. Although there are many factors to consider when describing the vulnerability of a ground water system, **all surface water systems are considered highly vulnerable** since surface water is open to the atmosphere and has relatively rapid times of travel for contaminant movement measured by hours or days as compared to years for groundwater. Surface waters are considered highly vulnerable because a spill can enter the stream via overland flow and travel rapidly within hours along the stream to the downstream water supply intake.

For this reason, the United Water Delaware surface water intake at Smalleys Pond is considered highly vulnerable to substances entering the raw (untreated) water source.

Figure 2: Vulnerability Determination Chart



1 - GWUDI = Ground Water Under the Direct Influence of Surface Water (i.e. well located very close to a surface water body)

2 - Well Integrity = The physical well construction if known, or an assumption based upon the effective date of 1969 for the State Well Regulations



## Chapter 4: Potential Sources of Contamination Inventory

The University of Delaware Water Resources Agency mapped the potential sources of contamination in the source water area for the United Water Delaware at Stanton intake. This involved utilizing information developed for discrete sources by the Delaware DNREC in its Site Index Database, by the Pennsylvania Department of Environmental Protection for selected discrete sources (those for which the state has developed digital data), and by the Maryland Department of Environment. The land use data for Delaware was developed by WRA using 1993 aerial photography which was field checked in 1995, for Pennsylvania the source was the Delaware Valley Regional Planning Commission (1995), and for Maryland the source was the Cecil County Office of Planning and Zoning (1993).

### 4.1 Discrete (Point) Sources

Discrete sources, also known as “point sources” are defined as any single identifiable potential source of pollution, or more specifically, any discernible or confined conveyance from which pollutants are or may be discharged. Discrete sources include pipes, ditches, channels, tunnels, conduits, containers, vessels, and stationary location or facility from which pollutants are emitted. The Delaware Source Water Assessment Plan separated discrete sources into the following categories following a scheme established by the State DNREC:

Hazardous Substance Sites (Superfund/SIRB)	Large On-site Septic Systems
Underground Storage Tanks/Leaking USTs	Waste Water Spray Irrigation
Landfills/Dumps	Waste Sludge Application
NPDES Waste Water Systems	Confined Animal Feed Operations
Tire Piles	Combined Sewer Overflows
Hazardous Waste Generators	Dredge Spoils
Toxic Release Inventory Sites	Domestic Septic Systems
Salvage Yards	SARA Title III Sites
Pesticide Loading & Mixing Areas	

The existence of a discrete source doesn't necessarily mean it is discharging a contaminant and even if there is a discharge it may be regulated by a permit. However, its location within a source water area may provide a threat to the drinking water source. The Delaware DNREC has developed an extensive database (called the Site Index Database) of discrete sources and has determined the relative risk that almost every discrete source in Delaware poses to a variety of media including surface waters. The DNREC rates a discrete source's potential to release contaminants using a numerical scale ranging from -1 to 6 which corresponds to a ranking of “Not Rated” to “Offsite Contamination Present.” For the source water assessments, these numerical ratings (-1 to 6) have been grouped and given a Contaminant Potential Rating as presented in Table 4.

**Table 4: Discrete Source Contaminant Potential Ratings**

Contaminant Potential Rating	Description
Negligible	Contaminant(s) not present in sufficient quantities in Source Water Area to cause concern.
Low	Contaminant(s) present in significant quantities in Source Water Area, but monitoring indicates no or minimal releases.
Medium	Contaminant(s) could be present at levels of concern. No or insufficient monitoring. Additional information may be required.
High	Data indicate that contaminant(s) are present in sufficient quantities in Source Water Area to cause concern. (Permitted Discharge or Non-Permitted Release)

The source water area for the UWD at Smalleys Pond intake is the Christina River watershed which extends into Pennsylvania and Maryland, therefore discrete source data was also obtained from the Pennsylvania Department of Environmental Protection (PADEP) and the Maryland Department of Environment (MDE). It is important to note that PADEP's and MDE's discrete source data has not been given a contaminant potential rating similar to Delaware; therefore, the Delaware DNREC made the policy decision that all discrete sources in Pennsylvania and Maryland will be initially rated as **Medium** as described in Table 4 unless the type of facility poses a Negligible contaminant risk for a specific category of contaminant. For example, a spray irrigation site poses a Negligible risk for the following categories – petroleum, pesticides, and PCBs (see Appendix D). It should also be noted that the discrete source categories used by PADEP and MDE were not always the same terminology as specified in the SWAP, therefore, the WRA revised some of the discrete sources to match the categories used by Delaware as listed on the previous page. Also, there was limited or no digital data provided by the other states for the following categories – hazardous substance sites, leaking and underground storage tanks, tire piles, hazardous waste generators, toxic release inventory sites, salvage yards, pesticide loading, mixing areas, waste sludge application areas, confined animal feed operations, combined sewer overflows, dredge spoils, domestic septic systems, and SARA Title III sites. It is reasonable to assume that there are some of these potential contaminant sites within this source water area in Pennsylvania and Maryland, but the exact numbers and locations are unknown at this time.

The tables provided in Appendices B and C list the discrete sources found within the delineated source water areas for the UWD at Smalleys Pond intake. The tables provide the location by Level 1 or 2 and by state, the name of the site, the state ID number, and the potential threat each discrete source poses to surface water for each of the eight contaminant categories (nutrients, pathogens, etc.). A reminder that the **discrete sources within the Level 1 areas** poses the greatest threat to the water source. It is also important to note that the distance from the discrete source to the waterway can have an influence on the risk posed by the potential contaminant



since many substances as they move across the land will not reach the waterway or will breakdown and dilute as they move. Therefore, following the procedure in the Source Water Assessment Plan, the contaminant potential rating of discrete sources in **Level 2 areas** (which are further from the streams) in both Delaware, Pennsylvania, and Maryland have been lowered one rating (i.e. High to Medium, Medium to Low, etc.).

### Summary of Discrete Source Inventory

A numerical summary of the discrete source inventory is provided in Table 5. The Delaware portion of the delineated UWD intake at Smalleys Pond source water area contains a total of 333 discrete sources with 44 of those in the Level 1 area. All of these discrete sources have been investigated and rated by DNREC.

In the Pennsylvania and Maryland portion of this source water area the contaminant inventory is incomplete. In Pennsylvania there is 1 known discrete source, a large on-site septic system in the Level 2 area and in the Maryland portion there are 2 known discrete sources, both NPDES wastewater discharges. A reminder that data for some of the discrete source categories that are available for Delaware was not included in the information provided by Pennsylvania and Maryland.

**Table 5: Number of Discrete Sources by Category**

Site Type	DE		PA		MD	
	Level 1	Level 2	Level 1	Level 2	Level 1	Level 2
Hazardous Substance Sites (Superfund and SIRB)	5	29	*	*	*	*
Underground Storage Tanks	19	172	*	*	*	*
Landfills/Dumps	0	2	0	0	0	0
NPDES Wastewater Discharges	0	**	0	**	2	**
Waste Water Outfalls	8	**	0	**	0	**
Tire Piles	0	1	*	*	*	*
Hazardous Waste Generators	10	71	*	*	*	*
Toxic Release Inventory (TRI) Sites	2	10	*	*	*	*
Salvage Yards	0	4	*	*	*	*
Pesticide Loading, Mixing Areas	0	0	*	*	*	*
Large On-Site Septic Systems	0	0	0	1	*	*
Waste Water Spray Irrigation	0	0	0	0	*	*
Waste Sludge Application	0	0	*	*	*	*
Confined Animal Feed Operations (CAFOs)	0	0	*	*	*	*
Combined Sewer Overflows	0	0	*	*	*	*
Dredge Spoils	0	0	*	*	*	*
Domestic Septic Systems	*	*	*	*	*	*
SARA Title III Sites	*	*	*	*	*	*

\* Limited or No Data Available.

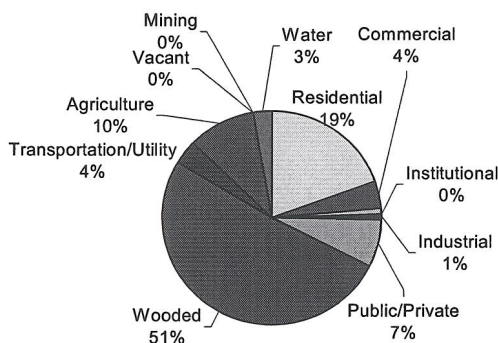
\*\* NPDES and Wastewater Outfalls are classified as Level 1 because they discharge by pipe directly into drainage channels or streams.



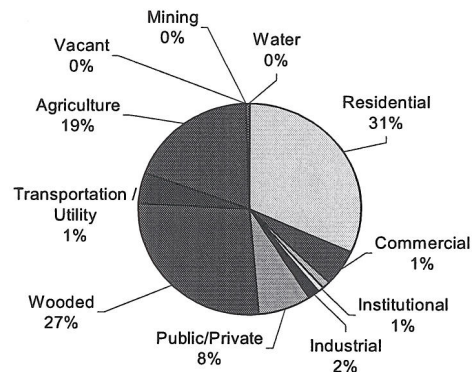
## 4.2 Land Use (Non-point) Sources

Land use has a great effect on surface water quality. During precipitation events, materials on the land can move along with the precipitation runoff and some of those materials will enter streams. Therefore, the type of land use in a watershed plays a big role in the quality of a stream. Figures 3 and 4 below summarize land use in the source water area for the United Water Delaware Intake at Smalleys Pond on the Christina River. The chart on the left summarizes land use in the Level 1A & B areas, the areas closest to the streams. The chart on the right summarizes land use in the Level 2 area (the entire source water area upstream of the intake). Good land management practices in these areas can have very positive effects on water quality by capturing materials and preventing them from moving into the stream.

**Figure 3: Land Use in Level 1A & B**



**Figure 4: Land Use in Level 2**



The Level 1A & B areas (lands closest to the streams) total about 8 square miles (about 4,955 acres). The land use along these waterways is very important for water quality since materials have the shortest distance to travel to get into the stream. Vegetation along streams can help filter sediments and prevent materials from entering streams, whereas barren ground will allow materials to quickly move with stormwater runoff into the flowing watercourse. Therefore, it is important to note that the majority of the land use in the Level 1 areas, 51%, is wooded. This provides an excellent buffer for protecting water quality.

The entire source water area upstream of the UWD at Smalleys Pond intake, the Level 2 area, totals about 47 square miles (about 29,927 acres). About a third of this area is residential, a third wooded and public/private space, and the remaining third a mix of land uses.

The potential impacts from land use are summarized in Table 6. The State DNREC developed the tables provided in Appendix E to determine the potential for each type of land use to contaminate surface water for each contaminant category. The total impact from land use is determined by considering the amount of each type of land use within the Level 1 and Level 2 source water areas and the potential contamination ratings (Negligible to High) for each contaminant category.

**Table 6: United Water Delaware Intake at Smalleys Pond  
Land Use Contaminant Potential Summary**

<b>Level 2 Land Use</b>	<b>Sq. Miles</b>	<b>Acres</b>	<b>Percent</b>	<b>Nutrients</b>	<b>Pathogens</b>	<b>Petroleum</b>	<b>Pesticides</b>	<b>PCBs</b>	<b>Organics</b>	<b>Metals</b>	<b>Inorganics</b>
Residential	14.8	9,448	31.6%	L	L	L	L	N	L	N	L
Commercial	3.1	1981	6.7%	L	N	L	L	L	L	L	L
Institutional	0.4	284	0.9%	N	N	L	L	L	L	N	L
Industrial	0.8	528	1.8%	N	N	L	N	L	L	L	L
Public/Private	3.6	2284	7.6%	L	N	N	N	N	N	N	N
Wooded	12.7	8149	27.2%	N	N	N	L	N	N	N	N
Transportation/Utility	2.2	1436	4.8%	L	L	L	L	L	L	L	N
Agriculture*	8.9	5672	19.0%	L	L	L	L	N	L	L	L
Vacant	0	0	0.0%	L	N	N	N	N	N	N	N
Mining	0	0	0.0%	L	N	L	N	N	N	N	N
Water	0.2	0	0.5%								
<b>Total Level 2**</b>	<b>46.7</b>	<b>29,927</b>		L	L	L	L	N	L	N	L
<b>Level 1A &amp; B Land Use</b>											
Residential	1.5	964	19.5%	L	L	L	L	N	L	N	L
Commercial	0.4	252.1	5.1%	L	N	L	L	L	L	L	L
Institutional	0.0	5.1	0.1%	N	N	L	L	L	L	N	L
Industrial	0.0	34.0	0.7%	N	N	L	N	L	L	L	L
Public/Private	0.6	362.3	7.3%	L	N	N	N	N	N	N	N
Wooded	3.9	2531.1	51.1%	N	N	N	L	N	N	N	N
Transportation/Utility	0.3	181.8	3.7%	L	L	L	L	L	L	L	N
Agriculture*	0.8	492.2	9.9%	L	L	L	L	N	L	L	L
Vacant	0	0	0.0%	L	N	N	N	N	N	N	N
Mining	0	0	0.0%	L	N	L	N	N	N	N	N
Water	0.2	132.7	2.7%								
<b>Total Level 1A&amp;B**</b>	<b>7.7</b>	<b>4955</b>		L	N	L	L	N	L	N	N

N = Negligible

L = Low

M = Medium

H = High

\* Since the agriculture category of land use is not broken down into the 4 categories provided in Appendix E (cropland, CAFOs, Farmsteads, and Rangeland/Pasture), the contaminant potential for agriculture is the highest potential rating for the combined categories.

\*\* The Total, or overall land use rating for each contaminant category is determined by examining the rating for each land use for each contaminant category and using the rating that is prevalent in the majority of the land uses within each category. For example, in the Level 2 area Residential, Commercial, Public/Private, Transportation, and Agriculture comprises about 70% of the total land use and all are rated Low for nutrients so the rating used for the total potential nutrient impact on the source water from land use in Level 2 is Low.



### 4.3 Water Quality Data

The final and perhaps most important component of the susceptibility assessment for surface water intakes is a review of the historic water quality testing data. A listing of 142 substances of concern provided in the Delaware Source Water Assessment Plan was used as the basis for examining all of the water quality testing data available from about ten years of data from a variety of sampling programs as shown in Table 7. A reminder that the Delaware SWAP classifies contaminants into eight categories as follows:

<b><u>Category (# of substances of concern in category)</u></b>	<b><u>Examples</u></b>
Nutrients (3)	Nitrates
Pathogens (4)	Coliform, cryptosporidium, giardia
Petroleum (8)	Benzene, toluene
Pesticides (31)	Alachlor, endrin, lindane
Polychlorinated Biphenyls (1)	PCB
Other Organics (60)	Chloroform, PCE, TCE
Metals (18)	Copper, iron, zinc
Other Inorganics (17)	Chloride, fluoride, radon

**Table 7: Historic Stream Water Quality Data by Source (1990 – 2000)**

Stream Water Quality Data Received From:

	USGS TMDL	DNREC STORET	DNREC PCB	M&E EIS	Public Health	UWD
<b><i>Category</i></b>						
Nutrients						
Pathogens						
Petroleum Hydrocarbons						
Pesticides				White Clay Creek		
PCBs				White Clay Creek		
Other Organics VOC, SVOC		TTHM				
Metals						
Other Inorganics						

Black shade - Full data

Gray shade - partial data

A review of the existing data shows there was no water quality sampling result for some of the contaminant categories for some of the streams. Therefore, the State sampled each of the surface water streams at the intake during a low flow condition in the summer of 2001. Appendix F provides a compilation of both historic and this most current water quality test data for all 142 contaminants of concern listed in the SWAP that was assembled for this assessment. Table 8 provides a summary of those testing results. It is important to emphasize that several of the



contaminant categories contain naturally occurring substances like manganese. These substances have been detected and reported data are naturally occurring can't be eliminated from the source water area. The water suppliers' treatment process removes most of these substances.

**Table 8**  
**Historic/Current Testing Data Summarizing Substances Detected in the Untreated Water**  
**of the Christina River above the United Water Delaware at Smalleys Pond Intake**

Historic Sampling Data Substances Detected	Minimum Detection Level	50% of MCL for Treated Water or Screening Level	Treated Drinking Water Standard (PMCL/SMCL HAL/RBCL)	Untreated Water Maximum Level Detected 1990-2000	Date Sampled	Sampling Program	Current Sampling Data August 2001 Sampling by DNREC
	mg/L	mg/L	(mg/L)	(mg/L)			(mg/L)
<b><u>Nutrients</u></b> - 1 of 3 sampled							
Nitrate	0.10	5	10				0.36
Total Nitrogen as Nitrate + Nitrite	0.20	5	10	4.82	5/15/95	DNREC	**
<b><u>Pathogens</u></b> - 1 of 5 sampled							None Sampled
Enterococcus		0	0	2000	8/15/95	DNREC	**
<b><u>Petroleum Hydrocarbons</u></b> 0 of 8 sampled							All Sampled No Detects
<b><u>Pesticides</u></b> - 0 of 31 sampled							28 Sampled No Detects
<b><u>Polychlorinated biphenyls</u></b>		0.00025	0.0005	0.00001097	1996/97	DNREC	No Detect
<b><u>Other Organics</u></b> 3 of 59 sampled							44 Sampled 1 Detects
Bromodichloromethane	0.0005	0.00085	0.00170	0.05268	7/21/99	DNREC	No Detect
Chloroform	0.0005	0.040	0.080	0.5812	3/15/00	DNREC	0.0007
Chloromethane	0.0005	0.0105	0.021	0.01585	6/14/99	DNREC	No Detect
<b><u>Metals</u></b> - 8 of 18 sampled							15 Sampled
Aluminum	0.00020	0.025 - 0.1	0.05 -0.2	2.048	1/18/95	DNREC	0.336
Arsenic	0.004	0.005	0.01	0.00184	11/18/97	DNREC	No Detect
Copper	0.02	0.65	1.3	0.0336	11/18/97	DNREC	No Detect
Iron		0.15	0.30	6.379	4/16/96	DNREC	**
Lead	0.003	0.0075	0.015	0.0141	6/12/98	DNREC	No Detect
Manganese		0.025	0.05	0.2145	6/14/94	DNREC	**
Mercury	0.0002	0.001	0.002	0.0004	3/15/94	DNREC	No Detect
Zinc	0.000020	2.5	5.0	0.155	3/15/94	DNREC	No Detect
<b><u>Other Inorganics</u></b> 2 of 17 sampled							6 Sampled
Chloride	0.005	125	250	170	3/16/99	DNREC	37
Cyanide		0.1	0.2				0.22
Fluoride	0.0001	0.9	1.8				7.14
Sulfate	0.001	125	250				169
pH			6.5 – 8.5	High- 8.3 Low- 5.3	7/15/97 1/30/96	DNREC	9.7

\* The pH of surface water regularly fluctuates since it is an open system. pH fluctuation is usually not indicative of a contaminant problem and is always adjusted by treatment.

\*\* Not Sampled by DNREC in 2001.

The data in Table 8 was used to determine the final susceptibility for each contaminant category. According to the methodology in the Delaware SWAP, for synthetic compounds a detect at the minimum detection level, but less than the Primary or Secondary Drinking Water Standard Maximum Contaminant Level (MCL) is treated the same as a naturally occurring substance detected at above 50% but less than 100% of the MCL. Table 9 displays the substances found in the historic water quality testing data and their potential source.

**Table 9**  
**Summary of Substances Detected in the Untreated Water Christina River**  
**above United Water Delaware at Smalleys Pond Intake (1990-2001)**

<b>Contaminant Category</b>	<b>Substance</b>	<b>Potential Sources</b>
<b><i>Above Detection Level</i></b>		
<i>Nutrients</i>	Nitrate	Fertilizer, Wastewater Treatment
	Total Nitrogen as Nitrate + Nitrite	Fertilizer, Wastewater Treatment
<i>PCBs</i>	Polychlorinated biphenyls	Railroads, Electric Transmission Equipment
<i>Metals</i>	Arsenic	Orchard Runoff, Glass/Electronics Production
	Copper	Natural Deposits, Sewage Treatment
	Mercury	Refineries, Factories, Landfills
	Zinc	Industries
<b><i>Above 50% MCL/RBCL</i></b>		
<i>Other Organics</i>	Chloromethane	Wastewater Treatments
<i>Metals</i>	Lead	Brake Linings, Wastewater Treatment
<i>Other Inorganics</i>	Chloride	Road Salt, Deicing Chemicals
	Sulfate	Natural Deposits
<b><i>Above 100% MCL/RBCL</i></b>		
<i>Other Organics</i>	Bromodichloromethane	Wastewater Treatment
	Chloroform	Wastewater Treatment
<i>Metals</i>	Iron	Natural Deposits
	Manganese	Natural Deposits
	Aluminum	Natural Deposits
<i>Other Inorganics</i>	Cyanide	Metal Factories
	Fluoride	Natural Deposits, Fertilizer Factories

## Chapter 5: Susceptibility Determination

The information developed for this assessment is combined in this chapter to determine the susceptibility of the United Water Delaware at Smalleys Pond surface water intake to the eight contaminant categories. Susceptibility is determined using the following Source Water Susceptibility Determination Matrix (Figure 5).

**Figure 5: Source Water Susceptibility Determination Matrix**

			CONTAMINANT POTENTIAL				OBSERVED DATA	
			Contaminants not present in sufficient quantities in Source Water Area to cause concern.	Contaminant(s) present in significant quantities in Source Water Area but monitoring data indicates no or minimal releases	Contaminant(s) could be present at levels of concern. No or insufficient monitoring. Additional information may be required.	Data indicate that contaminant(s) are present in sufficient quantities in Source Water Area to cause concern. (Permitted Discharge or Non-Permitted Release)	Naturally occurring contaminant(s) detected in source (raw) water at levels > 50% of the MCL, but ≤ 100% of the MCL. Synthetic contaminant(s) found above Detect Level, but below the MCL. Active treatment may be in place	Contaminant(s) detected in source (raw) water at levels greater than 100% of the MCL. Active treatment may be in place
			INCREASING CONTAMINANT POTENTIAL				DETECTION	EXCEEDANCE
VULNERABILITY RATING	Surface Water Intakes	INCREASING VULNERABILITY	3	4	5	6	6	7
	GWUDI Well							
	Poor Integrity Well							
	Cockeysville Well							
	Shallow Unconfined Well							
	Crystalline Bedrock Well		2	3	4	5	6	7
	Semi-Confined Well							
	Deep Unconfined Well							
	Confined Well		1	2	3	4	6	7

SUSCEPTIBILITY SCALE						
LEAST		MODERATELY			MOST	
1	2	3	4	5	6	7

The intake will be assessed a score for each of the eight categories ranging from 1 (Not Susceptible) to 7 (Exceeds Standards) as shown in Table 10:

**Table 10: Source Water Susceptibility Range**

Susceptibility Rating	Susceptibility Text
1	Not Susceptible
2	Very Low Susceptibility
3	Low Susceptibility
4	Moderate Susceptibility
5	High Susceptibility
6	Very High Susceptibility
7	Exceeds Standards



The following table summarizes the information developed in this assessment and provides the final susceptibility rating.

**Table 11: Susceptibility of Untreated Water Rating Summary of Information  
United Water DE at Smalleys Pond Intake – Christina River  
Vulnerability: High**

Untreated Water Contaminant Potential Summary	Nutrients	Pathogens	Petroleum Hydro - carbons	Pesticides	PCBs	Other Organics	Metals	Other Inorganics
<b>Vulnerability</b>	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH
<i>Discrete Sources:</i>								
<b>Delaware: Level 1</b>	Medium	Medium	Medium	Negligible	Medium	Low	High	High
<b>Level 2</b>	Low	Low	Medium	Medium	Medium	Medium	Medium	Medium
<b>Maryland Level 1</b>	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium
<b>Level 2</b>	Low	Low	Low	Low	Low	Low	Low	Low
<b>Penn: Level 1</b>	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium
<b>Level 2</b>	Low	Low	Low	Low	Low	Low	Low	Low
<i>Land Use:</i>								
<b>Level 1</b>	Low	Negligible	Low	Low	Negligible	Low	Negligible	Negligible
<b>Level 2</b>	Low	Low	Low	Low	Negligible	Low	Negligible	Low
<i>Susceptibility:</i>								
<b>Based on Discrete Sources</b>	High	High	High	High	High	High	Very High	Very High
<b>Based on Land Use</b>	Moderate	Moderate	Moderate	Moderate	Low	Moderate	Low	Moderate
<b>Based on Analytical Data</b>					**	**	7 Exceedance	7 Exceedance
<b>Final Susceptibility Determination*</b>	High (5)	High (5)	High (5)	High (5)	High (5)	High (5)	Exceeds Standards (7)	Exceeds Standards (7)

\* It is also important to understand that the methodology developed in the Source Water Assessment Plan and the decisions made by the State DNREC concerning how to rank the unranked discrete source data for Pennsylvania (assumed to have a **Medium** contaminant potential – contaminant could be present at levels of concern, additional data needed) results in all of the surface water assessments having Final Susceptibility Determinations for all of the eight categories of contaminants that can be no less than a rating of **High Susceptibility**.

\*\* The most recent testing data (August 2001) shows as undetected substance(s) previously detected in the source water. Even though susceptibility determinations could be lowered based upon this new data, it was decided that the susceptibility would not be raised or lowered.

The following Table provides the final source water susceptibility rating for each contaminant category for the United Water Delaware at Smalleys Pond Intake on the Christina River along with a brief reason for the ranking.

**Table 12:**  
**Susceptibility to Contamination of the Untreated Water from the Christina River entering the United Water Delaware at Smalleys Pond Intake**

Substance	Overall Susceptibility	Rating	Comments Regarding Substances Detected in Raw Water (Treatment is in Place)
Metals	Exceeds Standards	7	<b>Historic Testing Data</b> shows Aluminum, Iron, and Manganese detected in untreated water above 100% MCL Secondary Drinking Water Standards. <b>August 2001 Testing Data</b> shows Aluminum detected in untreated water above 100% MCL.
Other Inorganics	Exceeds Standards	7	<b>Historic Testing Data</b> shows Chloride detected in untreated water above 50% Secondary Drinking Water Standard MCL. <b>August 2001 Testing Data</b> shows Cyanide detected above 100% MCL Primary Drinking Water Standard.
Nutrients	High	5	Potential Sources present in watershed
Pathogens	High	5	Potential sources present in watershed.
Petroleum Hydrocarbons	High	5	Potential sources present in watershed.
Pesticides	High	5	Potential sources present in watershed.
PCBs	High	5	<b>Historic Testing Data</b> shows PCBs detected in untreated water above the detection level. <b>August 2001 Testing Data</b> shows PCBs were undetected in the untreated water.
Other Organics	High	5	<b>Historic Testing Data</b> shows Chloroform detected in untreated water above 100% MCL; Bromodichloromethane detected above 100% Risk Based Concentration Level. <b>August 2001 Testing Data</b> shows only Chloroform detected in untreated water and it is below 50% MCL.
	Moderate	4	
	Low	3	
	Very Low	2	
	Not Susceptible	1	

The susceptibility assessment for the United Water Delaware at Smalleys Pond water system intake on the Christina River should be understood in context with the following provision:

**UNITED WATER DELAWARE EMPLOYS WATER TREATMENT PROCESSES TO MEET DELAWARE DRINKING WATER STANDARDS.** For more information about the United Water Delaware Water System please call 302-633-5900 between the hours of 9 am and 5 pm Monday - Friday.

## REFERENCES

Delaware Department of Natural Resources and Environmental Control and University of Delaware, Institute for Public Administration, Water Resources Agency. *The State of Delaware Source Water Assessment Plan*. October 1999.

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Metcalf and Eddy. *Supplemental Environmental Studies, Water Supply Plan for New Castle County, Delaware, Spring 1996 High Flow Sampling Plan*. November 6, 1996, revised March 3, 1997.

U.S. Geological Survey. *Christina Basin Total Maximum Daily Load, Stream Monitoring Data*. 1998.

United Water Delaware. *Consumer Confidence Report - On Tap 1999 Water Quality Report*. 1999.



## **Appendix A**

### **Maps for United Water Delaware Christina River at Smalleys Pond Intake Source Water Assessment**

- **Delineated Source Water Areas**
- **Discrete Potential Sources of Contamination**
- **Non-Point Potential Sources of Contamination**

*The maps have been temporarily removed from this document.*

*Please contact the Source Water Assessment and Protection Program at  
Phone: (302) 739-4793 or Fax: (302) 739-2296 to request more information  
regarding these maps.*

## Appendix B

### Contaminant Ratings for Discrete Potential Sources of Contamination in the Source Water Area for the United Water Delaware at Smalleys Pond Intake – Level 1A & B

The following table provides an inventory of the discrete potential sources of contamination within the United Water Delaware at Smalleys Pond intake Level 1A & B source water area. The Level 1A & B area is the land closest to the waterways and includes the 100-year floodplain, erosion-prone slopes (in Delaware), and a 200-foot buffer from each side of the waterway. The table lists the discrete sources by state, type of discrete source, name of the site, if it is in Level 1A or B, the state identification number, and the potential the site poses to contaminate surface water for each of the eight categories of contaminants. The Contaminant Potential Ratings are as follows:

<i>Rating</i>	<i>Description</i>
<b>Negligible</b>	Contaminant(s) not present in sufficient quantities in Source Water Area to cause concern.
<b>Low</b>	Contaminant(s) present in significant quantities in Source Water Area, but monitoring indicates no or minimal releases.
<b>Medium</b>	Contaminant(s) could be present at levels of concern. No or insufficient monitoring. Additional information may be required.
<b>High</b>	Data indicate that contaminant(s) are present in sufficient quantities in Source Water Area to cause concern. (Permitted Discharge or Non-Permitted Release)

All sites in Delaware have been rated by the Delaware DNREC; all sites in Pennsylvania and Maryland have not been rated so the Delaware DNREC made the policy decision that all discrete sources in Pennsylvania and Maryland will be initially rated as Medium as described above unless the type of facility poses a Negligible contamination risk for a specific category of contaminant. For example, a spray irrigation site poses a Negligible risk for the following categories of contaminants – petroleum, pesticides, and PCBs.

Contaminant Ratings for Discrete Potential Sources of Contamination - UWD at Smalleys Pond - Level 1A & B  
(floodplains, buffers, erosion prone slopes and all NPDES discharges)

State	Site Type	Site Name	A/B	Site ID	Nutrients	Pathogens	Petroleum	Pesticides	PCBs	Other Organics	Metals	Other Inorganics
DE	HW Gen	All Trans Transmission Inc	B	DE0000193151	N	L	L	L	L	L	L	L
	HW Gen	Autotote Systems	A	DE-112060	N	L	L	L	L	L	L	L
	HW Gen	Chrome Deposit Corp	B	DED98406611	N	L	L	L	L	L	L	L
	HW Gen	DEPRC Serical USA	A	DED98407208	N	L	L	L	L	L	L	L
	HW Gen	First State Printing	B	DER00000157	N	L	L	L	L	L	L	L
	HW Gen	Fisher Scientific	A	DED98193804	N	L	L	L	L	L	L	L
	HW Gen	Mobil Oil Corp SS # L6E	A	DED98407170	N	L	L	L	L	L	L	L
	HW Gen	Ocel America Inc	A	DER14	N	L	L	L	L	L	L	L
	HW Gen	Puz's Body Shop	A	DED-98407291	N	L	L	L	L	L	L	L
	HW Gen	Salem Dry Cleaners Inc	B	DED98266087	N	L	L	L	L	L	L	L
	Superfund Sites	Bayshore Car and Truck Rental	A	DE-1162	N	N	N	N	N	N	N	N
	Superfund Sites	Fox Run Open Space #3 (Townhouses)	B	DE-1023	N	N	N	N	N	N	N	N
	Superfund Sites	Mill Road Landfill	A	DE-091	N	N	N	N	N	N	N	N
	Superfund Sites	Raintree	B	DE-171	N	N	N	N	N	N	N	N
	Superfund Sites	Salem Church - Muddy Run Dump	A	DE-193	M	M	M	M	M	M	M	M
	Toxics Release Inventory Sites	Chrome Deposit	B	19713CHRM09TYLE	L	L	L	L	L	L	L	L
	Toxics Release Inventory Sites	E-A-R Specialty Comp	B	19713SPCLT69DA	N	N	N	N	N	N	N	N
	US Tanks	A&H Metals	B	3001391	N	N	L	N	N	L	N	N
	US Tanks	Autotote	A	3001561	N	N	L	N	N	L	N	N
	US Tanks	Bear Concrete Inc	A	3001264	N	N	M	N	N	M	N	N
	US Tanks	Dayett Mills Property	B	3001671	N	N	M	N	N	M	N	N
	US Tanks	Delaware Turnpike Exxon	A	3000325	N	N	H	N	N	H	N	N
	US Tanks	Enniss Elecenter	B	3001120	N	N	L	N	N	L	N	N
	US Tanks	Exxon I-95 Turnpike #25726	A	3001249	N	N	L	N	N	L	N	N
	US Tanks	Former Allens Kero	A	3000924	N	N	M	N	N	M	N	N
	US Tanks	Glasgow Sunoco	B	9000077	N	N	L	N	N	L	N	N
	US Tanks	M&K Bus Service	B	3000552	N	N	L	N	N	L	N	N
	US Tanks	New London TextileInc	A	3001297	N	N	L	N	N	L	N	N



Contaminant Ratings for Discrete Potential Sources of Contamination - UWD at Smalleys Pond - Level 1A & B  
(floodplains, buffers, erosion prone slopes and all NPDES discharges)

State	Site Type	Site Name	A/B	Site ID	Nutrients	Pathogens	Petroleum	Pesticides	PCBs	Other	Organics	Metals	Other Inorganics
DE	US Tanks	Sandalwood Apartments	B	3000934	N	N	H	N	N	H	N	N	N
	US Tanks	Village of Becks Pond	A	3001302	N	N	M	N	N	M	N	N	N
	US Tanks	W.L. Gore & Assoc., Inc	A	3000105	N	N	N	N	N	N	N	N	N
	Waste Water Outfalls	Diamler Chrysler Corp.	*		N	N	N	N	N	N	N	N	N
	Waste Water Outfalls	DuPont Stine-Haskell Research	*		N	N	N	N	N	N	N	N	N
	Waste Water Outfalls	Goodchild Inc.	*		N	N	N	N	N	N	N	N	N
	Waste Water Outfalls	New London Textile, Inc.	*		N	N	N	N	N	N	N	N	N
	Waste Water Outfalls	Pioneer Concrete Inc. (South P	*		N	N	N	N	N	N	N	N	N
	Waste Water Outfalls	Roadway Express, Inc. (T157)	*		N	N	N	N	N	N	N	N	N
	Waste Water Outfalls	Rocla Concrete Tie, Inc.	*		N	N	N	N	N	N	N	N	N
	Waste Water Outfalls	Rodel, Inc.	*		N	N	N	N	N	N	N	N	N

\* All Discrete sources categorized as NPDES or wastewater outfalls are classified as Level 1 because they discharge by pipe directly into drainage channels or streams although the facility may be located outside of the Level 1 area.

## Appendix C

### Contaminant Ratings for Discrete Potential Sources of Contamination in the Source Water Area for the United Water Delaware at Smalleys Pond Intake – Level 2

The following table provides an inventory of the discrete potential sources of contamination within the United Water Delaware at Smalleys Pond intake Level 2 source water area. The Level 2 area is the land within the watershed upstream of the intake but further from the waterways than the Level 1 areas. The table lists the discrete sources by state, type of discrete source, name of the site, the state identification number, and the potential the site poses to contaminate surface water for each of the eight categories of contaminants. The Contaminant Potential Ratings are as follows:

<i>Rating</i>	<i>Description</i>
<b>Negligible</b>	Contaminant(s) not present in sufficient quantities in Source Water Area to cause concern.
<b>Low</b>	Contaminant(s) present in significant quantities in Source Water Area, but monitoring indicates no or minimal releases.
<b>Medium</b>	Contaminant(s) could be present at levels of concern. No or insufficient monitoring. Additional information may be required.
<b>High</b>	Data indicate that contaminant(s) are present in sufficient quantities in Source Water Area to cause concern. (Permitted Discharge or Non-Permitted Release)

All sites in Delaware have been rated by the Delaware DNREC; all sites in Pennsylvania and Maryland have not been rated so the Delaware DNREC made the policy decision that all discrete sources in Pennsylvania and Maryland will be initially rated as Medium as described above unless the type of facility poses a Negligible contamination risk for a specific category of contaminant. For example, a spray irrigation site poses a Negligible risk for the following categories of contaminants – petroleum, pesticides, and PCBs. Then, following the procedure in the Source Water Assessment Plan, the contaminant potential rating of discrete sources in Level 2 areas in both Delaware, Pennsylvania, and Maryland have been lowered one rating (i.e. High to Medium, Medium to Low, etc.) since the discrete source is further from the waterway and has less potential to get into the water.

Contaminant Ratings for Discrete Potential Sources of Contamination - UWD at Smalleys Pond - Level 2  
(Outside Level 1 areas but within watershed)

State	Site Type	Site Name	Site ID	Nutrients		Pathogens	Petroleum	Pesticides	PCBs	Other Organics	Metals	Other Inorganics
DE	HW Gen	A & W Coachworks Inc.	DER00000047	N	N	N	N	N	N	N	N	N
	HW Gen	A/C 100	DED98268601	N	N	N	N	N	N	N	N	N
	HW Gen	Alanx Wear Solutions	DER000001644	N	N	N	N	N	N	N	N	N
	HW Gen	All American Eng Co	DED05899768	N	N	N	N	N	N	N	N	N
	HW Gen	All Trans Transmission	DE193151	N	N	N	N	N	N	N	N	N
	HW Gen	Allied Signal Composites	DER-158	N	N	N	N	N	N	N	N	N
	HW Gen	Ametek	DED-98407372	N	N	N	N	N	N	N	N	N
	HW Gen	Amoco #5185	DER00000066	N	N	N	N	N	N	N	N	N
	HW Gen	Amoco Stations Inc	DED98407287	N	N	N	N	N	N	N	N	N
	HW Gen	Amtrak Bear Complex- Bear Del	DED98104272	N	N	N	N	L	N	N	L	L
	HW Gen	Astropower Inc.	DER-195	N	N	N	N	N	N	N	N	N
	HW Gen	Automotive Components Inc	DE0000234948	N	N	N	N	N	N	N	N	N
	HW Gen	Automotive Restorations	DER-217	N	N	N	N	N	N	N	N	N
	HW Gen	Batta Environmental Associates	DER-119	N	N	N	N	N	N	N	N	N
	HW Gen	Bell Atlantic	DED-984072066	N	N	N	N	N	N	N	N	N
	HW Gen	Bridgestone/ Firestone	DED98408495	N	N	N	N	N	N	N	N	N
	HW Gen	Bridgestone/Firestone Tire Sto	DED984074955	N	N	N	N	N	N	N	N	N
	HW Gen	Commercial Carriers Inc	DED048598643	N	N	N	N	N	N	N	N	N
	HW Gen	Cramaro	DER000000075	N	N	N	N	N	N	N	N	N
	HW Gen	CSX Transportation Inc.	DER000000056	N	N	N	N	N	N	N	N	N
	HW Gen	Cytac Fiberite Inc AM&S	DER000001144	N	N	N	N	N	N	N	N	N
	HW Gen	Dade Behring	DER-115	N	N	N	N	N	N	N	N	N
	HW Gen	Daimler/Chrysler Newark Assemb	DED0235740	N	N	N	N	N	N	N	N	N
	HW Gen	Delaware Turnpike	DED98407425	N	N	N	N	N	N	N	N	N
	HW Gen	Delttrans Inc.	DED16274770	N	N	N	N	N	N	N	N	N
	HW Gen	DEPRC Serical USA Inc	DED98407220	N	N	N	N	N	N	N	N	N
	HW Gen	DuPont- Glasgow Business Com	DE0001017102	N	N	M	M	M	M	M	M	M



Contaminant Ratings for Discrete Potential Sources of Contamination - UWD at Smalleys Pond - Level 2  
(Outside Level 1 areas but within watershed)

State	Site Type	Site Name	Site ID	Nutrients	Pathogens	Petroleum	Pesticides	PCBs	Other Organics	Metals	Other Inorganics
DE	HW Gen	E I DuPont de Nemours & Co Inc	DED04226376	N	N	N	N	N	N	N	N
	HW Gen	E I DuPont Pencader Plant	DED04732161	N	N	N	N	N	N	N	N
	HW Gen	Eastern Marine	DER-280	N	N	N	N	N	N	N	N
	HW Gen	Exxon	DED-98407140	N	N	N	N	N	N	N	N
	HW Gen	Exxon	DED-98407144	N	N	N	N	N	N	N	N
	HW Gen	Exxon	DED-98407143	N	N	N	N	N	N	N	N
	HW Gen	Fox Run Dry Cleaners	DER-173	N	N	N	N	N	N	N	N
	HW Gen	Glasgow High School	DER-81	N	N	N	N	N	N	N	N
	HW Gen	Glasgow Auto Body	DE0000450452	N	N	N	N	N	N	N	N
	HW Gen	Gore, W L & Associates Inc- Ne	DED98103888	N	N	N	L	N	N	L	L
	HW Gen	Graver Chemical Co.	DER-2	N	N	N	N	N	N	N	N
	HW Gen	H K Griffith Inc.	DED-984073478	N	N	N	N	N	N	N	N
	HW Gen	Hodgson Vo Tech	DED98407377	N	N	N	N	N	N	N	N
	HW Gen	Hunter Engineering & Consultin	DE0000450726	N	N	N	N	N	N	N	N
	HW Gen	J & M Litterelle Inc	DED05714554	N	N	N	N	N	N	N	N
	HW Gen	Jairus Inc.	DED07550068	N	N	N	N	N	N	N	N
	HW Gen	Jiffy Lube	DE-757880	N	N	N	N	N	N	N	N
	HW Gen	Kernys Body Shop	DED03943554	N	N	N	N	N	N	N	N
	HW Gen	Lily Truck Leasing	DE0000918771	N	N	N	N	N	N	N	N
	HW Gen	Livingston Health Care Service	DER-286	N	N	N	N	N	N	N	N
	HW Gen	Mac Knett Body Shop	DER-000000380	N	N	N	N	N	N	N	N
	HW Gen	Maintenance Services Inc	DED98407208	N	N	N	N	N	N	N	N
	HW Gen	MBK Auto Inc.	DE-307579	N	N	N	N	N	N	N	N
	HW Gen	Mobil Oil Corp SS# QJ	DE0000450916	N	N	N	N	N	N	N	N
	HW Gen	New London Textiles	DED98407532	N	N	N	N	N	N	N	N
	HW Gen	New London Textiles	DED98407544	N	N	N	N	N	N	N	N















Contaminant Ratings for Discrete Potential Sources of Contamination - UWD at Smalleys Pond - Level 2  
(Outside Level 1 areas but within watershed)

State	Site Type	Site Name	Site ID	Nutrients	Pathogens	Petroleum	Pesticides	PCBs	Other Organics	Metals	Other Inorganics
DE	US Tanks	Delmarva Power & Light Company	3000972	N	N	N	N	N	N	N	N
	US Tanks	Downes Elementary School	3001634	N	N	N	N	N	N	N	N
	US Tanks	Dupont Bellevue	3000977	N	N	N	N	N	N	N	N
	US Tanks	Dupont Glasgow	3000083	N	N	N	N	N	N	N	N
	US Tanks	Dupont Stinehaskell Lab	3000855	N	N	N	N	N	N	N	N
	US Tanks	EA Cochran	9000520	N	N	N	N	N	N	N	N
	US Tanks	Eds Texaco	3000226	N	N	N	N	N	N	N	N
	US Tanks	Estate of Warren W. Jones	3001103	N	N	N	N	N	N	N	N
	US Tanks	Everett Sunoco (car wash)	3001699	N	N	N	N	N	N	N	N
	US Tanks	Exxon #27249 Castle Mall	3000332	N	N	N	N	N	N	N	N
	US Tanks	Exxon Brookside #22060	3000333	N	N	N	N	N	N	N	N
	US Tanks	Exxon Don Horton #25087	3000347	N	N	N	N	N	N	N	N
	US Tanks	F. Schumacher & Company	3000436	N	N	N	N	N	N	N	N
	US Tanks	Firestone Tire & Rubber	3000666	N	N	N	N	N	N	N	N
	US Tanks	Fixs General Store	3000983	N	N	N	N	N	N	N	N
	US Tanks	Flapdoodles Inc	3000777	N	N	N	N	N	N	N	N
	US Tanks	Folk Memorial Park	3001626	N	N	N	N	N	N	N	N
	US Tanks	Former ARCO Station	3000670	N	N	N	N	N	N	N	N
	US Tanks	Former Eckerts	3001246	N	N	N	N	N	N	N	N
	US Tanks	Former Garden Center	9000080	N	N	N	N	N	N	N	N
	US Tanks	Former Mitchell Shop	9000190	N	N	N	N	N	N	N	N
	US Tanks	Former Service Station	3001673	N	N	N	N	N	N	N	N
	US Tanks	Former Synthesis Technologies	3000808	N	N	N	N	N	N	N	N
	US Tanks	Getty Service Station 08659	3000400	N	N	N	N	N	N	N	N
	US Tanks	Getty Service Station 08667	3000412	N	N	N	N	N	N	N	N
	US Tanks	Glasgow Citgo	3000753	N	N	N	N	N	N	N	N
	US Tanks	Glasgow Court Trailer Park	3001683	N	N	N	N	N	N	N	N
	US Tanks	Glasgow Gulf	3000300	N	N	N	N	N	N	N	N



Contaminant Ratings for Discrete Potential Sources of Contamination - UWD at Smalleys Pond - Level 2  
(Outside Level 1 areas but within watershed)

State	Site Type	Site Name	Site ID	Nutrients	Pathogens	Petroleum	Pesticides	PCBs	Other Organics	Metals	Other Inorganics
DE	US Tanks	Glass Kitchen Restaurant	3000588	N	N	N	N	N	N	N	N
	US Tanks	Goodchild Inc	3001540	N	N	N	N	N	N	N	N
	US Tanks	Head Injury Recovery Center	3000857	N	N	N	N	N	N	N	N
	US Tanks	Heisler Brothers Warehouse	3001151	N	N	N	N	N	N	N	N
	US Tanks	Helix Corp	9000027	N	N	N	N	N	N	N	N
	US Tanks	Hillside Oil Company Inc	3001040	N	N	N	N	N	N	N	N
	US Tanks	Hodgson Votech School	3000784	N	N	N	N	N	N	N	N
	US Tanks	Holly Oil CO	3000259	N	N	N	N	N	N	N	N
	US Tanks	Holy Family Church	3001069	N	N	N	N	N	N	N	N
	US Tanks	ICI	3001133	N	N	N	N	N	N	N	N
	US Tanks	Interstate Business Park	3000721	N	N	N	N	N	N	N	N
	US Tanks	Iron Hill	3000601	N	N	N	N	N	N	N	N
	US Tanks	J & M Littlelle Inc	3000031	N	N	N	N	N	N	N	N
	US Tanks	Jamie Musselman Property	3001087	N	N	N	N	N	N	N	N
	US Tanks	K MART #7116	3000022	N	N	N	N	N	N	N	N
	US Tanks	K&S Garage	3001452	N	N	N	N	N	N	N	N
	US Tanks	Kenneth G Lilly Fasteners Inc	9000685	N	N	N	N	N	N	N	N
	US Tanks	King, Henry E. Jr	3000253	N	N	N	N	N	N	N	N
	US Tanks	L.B. Enterprises	3001649	N	N	N	N	N	N	N	N
	US Tanks	Lawn Doctor of Newark	3001499	N	N	N	N	N	N	N	N
	US Tanks	Lee Property	9000093	N	N	N	N	N	N	N	N
	US Tanks	Liberty Terrace Apartments	9000238	N	N	N	N	N	N	N	N
	US Tanks	Little Sisters of the Poor	3000222	N	N	N	N	N	N	N	N
	US Tanks	Louis Dreyfus Distribution	3001430	N	N	N	N	N	N	N	N
	US Tanks	May B Leasure Elementary School	3001631	N	N	N	N	N	N	N	N
	US Tanks	MBNA Corp	3000451	N	N	N	N	N	N	N	N
	US Tanks	McVey Elementary School	3001632	N	N	N	N	N	N	N	N
	US Tanks	Mellon Bank of Delaware	9000141	N	N	N	N	N	N	N	N

Contaminant Ratings for Discrete Potential Sources of Contamination - UWD at Smalleys Pond - Level 2  
(Outside Level 1 areas but within watershed)

State	Site Type	Site Name	Site ID	Nutrients	Pathogens	Petroleum	Pesticides	PCBs	Other Organics	Metals	Other Inorganics
DE	US Tanks	Merit Mechanical Company Inc	3000532	N	N	N	N	N	N	N	N
	US Tanks	Metal Masters Company	3001534	N	N	N	N	N	N	N	N
	US Tanks	Mobil	3000569	N	N	N	N	N	N	N	N
	US Tanks	Mobil Service Station #15	3000360	N	N	N	N	N	N	N	N
	US Tanks	Monty Auto	9000631	N	N	N	N	N	N	N	N
	US Tanks	Nagowski Property	9000490	N	N	N	N	N	N	N	N
	US Tanks	Narragansett Lexington Green	3000941	N	N	N	N	N	N	N	N
	US Tanks	Newark Clitgo Auto Repair	3000358	N	N	N	N	N	N	N	N
	US Tanks	Newark Cleaners	9000569	N	N	N	N	N	N	N	N
	US Tanks	Newark Parts DIST Center MOPAR	3001135	N	N	N	N	N	N	N	N
	US Tanks	Newark Public Well #15	9000059	N	N	N	N	N	N	N	N
	US Tanks	Norman E. Wright Trust	3001520	N	N	N	N	N	N	N	N
	US Tanks	Oaktree Apartments	3001036	N	N	N	N	N	N	N	N
	US Tanks	Old Rendering Plant Property	3000995	N	N	N	N	N	N	N	N
	US Tanks	Pencader Presbyterian W	9000016	N	N	N	N	N	N	N	N
	US Tanks	Process Industries	3001543	N	N	N	N	N	N	N	N
	US Tanks	R&K Motors	3000013	N	N	N	N	N	N	N	N
	US Tanks	R.A. Boyer Inc	3000115	N	N	N	N	N	N	N	N
	US Tanks	Radick's Chevron	3001694	N	N	N	N	N	N	N	N
	US Tanks	Rittenhouse Motor Co.	3000047	N	N	N	N	N	N	N	N
	US Tanks	Roadway Express Inc	3000527	N	N	N	N	N	N	N	N
	US Tanks	Robert C Peoples Inc	3000125	N	N	N	N	N	N	N	N
	US Tanks	Rodel Elastomer Products	3000989	N	N	N	N	N	N	N	N
	US Tanks	Rodel Inc	3000969	N	N	N	N	N	N	N	N
	US Tanks	Rylan Rentals Cave Holdings LLC	3000434	N	N	N	N	N	N	N	N
	US Tanks	Salem Center	9000467	N	N	N	N	N	N	N	N
	US Tanks	Shell Food Mart	3000187	N	N	N	N	N	N	N	N
	US Tanks	Shell Station	3000194	N	N	N	N	N	N	N	N



Contaminant Ratings for Discrete Potential Sources of Contamination - UWD at Smalleys Pond - Level 2  
(Outside Level 1 areas but within watershed)

State	Site Type	Site Name	Site ID	Nutrients	Pathogens	Petroleum	Pesticides	PCBs	Other Organics	Metals	Other Inorganics
DE	US Tanks	Shell Station	3000206	N	N	N	N	N	N	N	N
	US Tanks	Shore Stop #163	9000211	N	N	N	N	N	N	N	N
	US Tanks	Smith & Burris Company	3001447	N	N	N	N	N	N	N	N
	US Tanks	Smith, Robert	3001575	N	N	N	N	N	N	N	N
	US Tanks	Southgate Apartments	3000623	N	N	N	N	N	N	N	N
	US Tanks	St. Pauls Lutheran Church	3001072	N	N	N	N	N	N	N	N
	US Tanks	Stadium Citgo	3000262	N	N	N	N	N	N	N	N
	US Tanks	Stoney Creek Pumping Station	3000614	N	N	N	N	N	N	N	N
	US Tanks	Strawberry Run Apartments	3000900	N	N	N	N	N	N	N	N
	US Tanks	Sunoco 0004/8652	3000419	N	N	N	N	N	N	N	N
	US Tanks	Swift Independent Packing	3000445	N	N	N	N	N	N	N	N
	US Tanks	Texaco Service Station 140451315	3000016	N	N	N	N	N	N	N	N
	US Tanks	Turnpike Administration	3000579	N	N	N	N	N	N	N	N
	US Tanks	U of D Belmont House	3001739	N	N	N	N	N	N	N	N
	US Tanks	U of D College Town	3000842	N	N	N	N	N	N	N	N
	US Tanks	U of D Delaware Stadium	9000170	N	N	N	N	N	N	N	N
	US Tanks	U of D Dickinson Hall	3000843	N	N	N	N	N	N	N	N
	US Tanks	U of D English Language	3001643	N	N	N	N	N	N	N	N
	US Tanks	U of D Field House	3000701	N	N	N	N	N	N	N	N
	US Tanks	U of D Main Street	9000200	N	N	N	N	N	N	N	N
	US Tanks	U of D Public Safety	3000700	N	N	N	N	N	N	N	N
	US Tanks	U of D Rodney Hall	3000834	N	N	N	N	N	N	N	N
	US Tanks	U of D Theta Chi Fraternity	3001467	N	N	N	N	N	N	N	N
	US Tanks	UAW United Auto Workers	9000444	N	N	N	N	N	N	N	N
	US Tanks	UNIMart Inc	3000246	N	N	N	N	N	N	N	N
	US Tanks	University BP	3000348	N	N	N	N	N	N	N	N
	US Tanks	University Garden Apartments	3001346	N	N	N	N	N	N	N	N
	US Tanks	University Village Apartments	3000788	N	N	N	N	N	N	N	N



Contaminant Ratings for Discrete Potential Sources of Contamination - UWD at Smalleys Pond - Level 2  
(Outside Level 1 areas but within watershed)

State	Site Type	Site Name	Site ID	Nutrients							Pathogens	Petroleum	Pesticides	PCBs	Other Organics	Metals	Other Inorganics
DE	US Tanks	USA Training Academy Inc	3000149	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	US Tanks	VALTECH Inc	3000811	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	US Tanks	Victoria Mews Apartments	9000303	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	US Tanks	Village of Windhover Kent Apartments	3000927	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	US Tanks	W. Carl Cullen Inc	3001333	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	US Tanks	W.L. Gore and Assoc. Inc	3001096	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	US Tanks	Warren Truss Company Inc	9000208	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	US Tanks	Waterford Pump Station	9000487	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	US Tanks	Wawa Food Market #844	9000630	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	US Tanks	Wawa Food Markets #814	3000233	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	US Tanks	West Park Elementary School	3001235	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	US Tanks	Whitlock, Jeff	3001512	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	US Tanks	Whittington Sand & Gravel	3000119	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	US Tanks	Wilson Beverage Co.	3000473	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	US Tanks	Wilson Contracting Inc	3000127	N	N	N	N	N	N	N	N	N	N	N	N	N	N
PA	Septic System	Groff Electronics	455109	L	L	L	L	L	L	L	L	N	N	N	N	N	N

Note: All sources located in Level 2 areas have their ratings lowered by one level (high to medium, medium to low, etc.) due to their greater distance from the stream.

## Appendix D: Contaminant Potential from Unranked Discrete Sources for Surface Water by Levels

	Nutrients		Pathogens		Petroleum		Pesticides		PCBs		Other		Metals		Other		Inorganics		Turbidity	
	Surface Level 2	Surface Level 1	Surface Level 2	Surface Level 1	Surface Level 2	Surface Level 1	Surface Level 2	Surface Level 1	Surface Level 2	Surface Level 1	Surface Level 2	Surface Level 1	Surface Level 2	Surface Level 1	Surface Level 2	Surface Level 1	Surface Level 2	Surface Level 1	Surface Level 2	Surface Level 1
Discrete Sources																				
SIRB / CERCLA	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med
UST / LUST	Neg	Neg	Neg	Neg	Low	Med	Neg	Neg	Neg	Neg	Low	Med	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg
Landfills/Dumps	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med
NPDES	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med
Tire Piles	Neg	Neg	Neg	Neg	Low	Med	Neg	Neg	Neg	Neg	Low	Med	Low	Med	Neg	Neg	Low	Med	Low	Med
Hazardous Waste Gen. & TSD's	Neg	Neg	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med
Toxic Release Inventory	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med
Salvage Yards	Neg	Neg	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med
Pesticides L,M, & S	Low	Med	Neg	Neg	Neg	Neg	Low	Med	Neg	Neg	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med
Large On-Site Septic	Low	Med	Low	Med	Neg	Neg	Low	Med	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg
Waste Water Spray Irrigation	Low	Med	Low	Med	Neg	Neg	Neg	Neg	Neg	Neg	Low	Med	Low	Med	Neg	Neg	Low	Med	Low	Med
Waste Sludge Application	Low	Med	Low	Med	Neg	Neg	Neg	Neg	Neg	Neg	Low	Med	Low	Med	Neg	Neg	Low	Med	Low	Med
Confined Animal Feed Operation	Low	Med	Low	Med	Neg	Neg	Neg	Neg	Neg	Neg	Low	Med	Low	Med	Neg	Neg	Low	Med	Low	Med
Combined Sewer Overflows	Low	Med	Low	Med	Neg	Neg	Neg	Neg	Neg	Neg	Low	Med	Low	Med	Neg	Neg	Low	Med	Low	Med
Dredge Spoils	Low	Med	Low	Med	Neg	Neg	Neg	Neg	Neg	Neg	Low	Med	Low	Med	Neg	Neg	Low	Med	Low	Med
Golf Courses	Low	Med	Low	Med	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Low	Med	Neg	Neg	Low	Med	Low	Med
Domestic Septics	Low	Med	Low	Med	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg

Table prepared by Delaware DNREC, Fall 2001.



# Appendix E: Contaminant Potential from Land Use / Land Cover for Surface Water

Land Use	Nutrients		Pathogens		Petroleum		Pesticides		PCBs		Other Organics		Metals		Other Inorganics		Turbidity	
	Surface ≤50%	Surface >50%	Surface ≤50%	Surface >50%	Surface ≤50%	Surface >50%	Surface ≤50%	Surface >50%	Surface ≤50%	Surface >50%	Surface ≤50%	Surface >50%	Surface ≤50%	Surface >50%	Surface ≤50%	Surface >50%	Surface ≤50%	Surface >50%
Residential (110-114) <sup>1</sup>	Low	Med*	Low	Med*	Low	Med*	Low	Med*	Neg	Neg	Low	Med*	Neg	Neg	Low	Med*	Low	Neg
Commercial (120,121,125,129)	Neg	Med*	Neg	Neg	Low	Med*	Low	Med*	Low	Med*	Low	Med*	Low	Med*	Low	Med*	Low	Neg
- Vehicle Operations (122)	Neg	Neg	Neg	Neg	Low	Med*	Neg	Neg	Neg	Neg	Low	Med*	Low	Med*	Low	Med*	Low	Neg
- Junk/Salvage Yards (123)	Neg	Neg	Neg	Neg	Low	Med*	Neg	Neg	Low	Med*	Low	Med*	Low	Med*	Low	Med*	Low	Neg
Industrial (130)	Neg*	Neg*	Neg	Neg	Low	Med*	Neg*	Neg*	Low	Med*	Low	Med*	Low	Med*	Low	Med*	Low	Neg
Transportation (145,146,149)	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Low	Neg
- Highways/Parking Lots (141,142)	Neg	Neg	Neg	Neg	Low	Med	Low	Med	Neg	Neg	Low	Med	Low	Med	Low	Med	Low	Neg
- Railroads (143)	Neg	Neg	Neg	Neg	Low	Med*	Low	Med*	Neg	Neg	Low	Med	Low	Med	Low	Med	Low	Neg
- Airports (144)	Neg	Neg	Neg	Neg	Low	Med*	Low	Med*	Neg	Neg	Low	Med	Low	Med	Low	Med	Low	Neg
Utilities (150)	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Neg
Combined Urban (160,170,180)	Neg	Neg	Neg	Neg	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Med	Low	Neg
Recreation (190)	Low	Med	Neg	Neg	Low	Med	Low	Med	Neg	Neg	Neg	Neg	Neg	Neg	Low	Med	Low	Neg
Cropland (211,213,214,215,220,230)	Low	Med**	Neg	Neg	Low	Med**	Low	Med**	Neg	Neg	Low	Med**	Low	Med**	Low	Med**	Low	Neg
CAFOs (236)	Low	Med*	Low	Med*	Low	Med*	Low	Med*	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Low	Neg
Farms/beads (240)	Low	Med*	Low	Med*	Low	Med*	Low	Med*	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Low	Neg
Rangeland/Pasture (212,310,320,330)	Low	Med	Low	Med	Neg	Med	Neg	Med	Neg	Neg	Neg	Neg	Neg	Neg	Low	Med	Low	Neg
Forest Land (410,420,430)	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Low	Med	Low	Neg
- Clear-cut Forest (440)	Low	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg
Water (510,520,530,540,590)	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Low	Neg
Wetlands (600)	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg
Barren/Open (720,730,750)	Low	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Low	Neg
Extraction (750)	Low	Med	Neg	Med	Low	Med	Neg	Med	Neg	Neg	Neg	Med	Neg	Neg	Neg	Neg	Low	Neg

Med - Possible (May Require Further Analysis to Determine True Potential)

Neg - Not Probable

Neg - Not Applicable

1 - (110-114) refers to the Land Use / Land Cover categories as per the Andersen classification scheme (Andersen et al., 1976)

\* - Refer to Discrete Source Inventory

\*\* - Dependent Upon Percentage of Total Area

Table prepared by Delaware DNREC, Fall 2001.



## Appendix F

### SWAP Listing of Contaminants of Concern with Historic/Current Sampling Results for Substances in Untreated Water in the Christina River Upstream of the United Water Delaware at Smalleys Pond Intake Delaware Source Water Assessment and Protection Program (SWAPP)

	Minimum detection level	50% of MCL or Screening Level	Treated Drinking Water MCL or Screening Level	Risk Based Screening Level	Maximum Recorded Level for Untreated Water	
Parameter	mg/L	mg/L	mg/L	mg/L	1990–2000	Aug 6/7, 2001
<b>Nutrients</b>						
Nitrate Nitrogen	0.10	5	10			0.36
Nitrite Nitrogen	0.10	0.5	1			
Total Nitrogen (nitrate + nitrite)	0.20	5	10		4.82(5/15/95)	
<b>Pathogens</b>						
Cryptosporidium		0	0			
Enterococcus (#/100 ml)		0	0		2000(9/15/99)	
Fecal Coliform/E. Coli		0	0			
Giardia lamblia		0	0			
Total Coliform Bacteria		0	0			
<b>Petroleum Hydrocarbons</b>						
Benzene	0.0005	0.0025	0.005			U
Ethylbenzene	0.0005	0.350	0.7			U
m-xylene						U
MTBE	0.0005	0.005	0.010			U
o-xylene						U
p-xylene						U
Toluene	0.0005	0.5	1			U
Total Xylene	0.0005	5.0	10.0			U
<b>Pesticides</b>						
2,3,7,8-TCDD (Dioxin)		1.5x10 <sup>-8</sup>	3x10 <sup>-8</sup>			
2,4,5-TP (Silvex)	0.0005	0.025	0.05			U
2,4-D	0.0005	0.035	0.07			U
Alachlor	0.00001	0.001	0.002			U
Aldicarb		0.0015	0.003			U
Aldicarb Sulfone		0.001	0.002			U
Aldicarb Sulfoxide		0.002	0.004			U
Atrazine	0.0007	0.0015	0.003			U
Benzo(a)pyrene	0.001	0.0001	0.0002			U
Carbofuran		0.02	0.04			U
Chlordane		0.001	0.002			U
Dalapon	0.0005	0.1	0.2			U
Di(2-ethylhexyl)adipate		0.2	0.4			U
Di(2-ethylhexyl)phthalate		0.003	0.006			U
Dinoseb	0.0005	0.0035	0.007			U
Diquat		0.01	0.02			U
Endothall		0.05	0.1			U
Endrin	0.0001	0.001	0.002			U
Ethylendibromide (EDB)		0.000025	0.00005			
Glyphosate		0.35	0.7			U

Parameter	Minimum detection level	50% of MCL or Screening Level	Treated Drinking Water MCL or Screening Level	Risk Based Screening Level	Maximum Recorded Level for Untreated Water	
	mg/L	mg/L	mg/L	mg/L	1990–2000	Aug 6/7, 2001
<b><u>Pesticides (con't)</u></b>						
Heptachlor	0.00005	0.0002	0.0004			U
Heptachlor epoxide	0.0005	0.0001	0.0002			U
Hexachlorobenzene	0.001	0.0005	0.001			U
Hexachlorocyclopentadien	0.001	0.025	0.05			U
Lindane		0.0001	0.0002			U
Methoxychlor	0.0005	0.02	0.04			U
Oxamyl (Vydate)		0.1	0.2			U
Pentachlorophenol	0.0005	0.0005	0.001			U
Picloram	0.0005	0.25	0.5			
Simazine	0.0005	0.002	0.004			U
Toxaphene	0.001	0.0015	0.003			U
<b><u>Polychlorinated biphenyls</u></b>		0.00025	0.0005		0.00001097(1996/97)	U
<b><u>Other Organics</u></b>						
2-chlorotoluene	0.0005	0.6		1.2		
4-chlorotoluene	0.0005	0.6		1.2		
Bromoform	0.0005	0.04	0.08			U
Bromobenzene	0.0005					
Bromochloromethane	0.0005					U
Bromodichloromethane	0.0005	0.00085		0.00170	0.05268(7/21/99)	U
Bromomethane	0.0005	0.0425		0.085		U
n- Butylbenzene	0.0005	1.2		2.4		U
Sec-butylbenzene	0.0005	1.2		2.4		U
Tert-butylbenzene	0.0005	1.2		2.4		U
Carbon tetrachloride	0.0005	0.0025	0.005			U
Chloroethane	0.0005	0.018		0.036		U
Chloroform	0.0005	0.040	0.080		0.5812(3/15/00))	0.0007
Chloromethane	0.0005	0.0105		0.021		U
Dibromochloromethane	0.0005	0.040	0.080		0.01585(6/14/99)	U
Dibromochloropropane		0.0001	0.0002			U
Dibromomethane	0.0005					
Dichlorodifluoromethane	0.0005	1.750		3.5		U
Foaming Agents			0.5			
Hexachlorobutadiene	0.0005			2.4		U
Bis (2-chloroethyl) Ether	0.0005	0.0045	0.009			U
Isopropylbenzene	0.0005	3.3		6.6		
4-Isopropyltoluene	0.0005					
Monochlorobenzene		0.05	0.1			
Naphthalene	0.0005	0.0325		0.065		U
o-Dichlorobenzene	0.0005	0.3	0.6			U
p-Dichlorobenzene	0.0005	0.0375	0.075			U
Propylbenzene		0.0035	0.007			U
Styrene	0.0005	0.050	0.1			U
Dichloromethane		0.0025	0.005			
Tetrachloroethylene	0.0005	0.0025	0.005			U
Total Trihalomethanes	0.0005	0.05	0.1			
Trichloroethylene		0.00025	0.005			U
Trichlorofluoromethane	0.0005	6.5		13.0		U
Trichloropropane						



	Minimum detection level	50% of MCL or Screening Level	Treated Drinking Water MCL or Screening Level	Risk Based Screening Level	Maximum Recorded Level for Untreated Water	
Parameter	mg/L	mg/L	mg/L	mg/L	1990–2000	Aug 6/7, 2001
<b>Other Organics (con't)</b>						
Vinyl Chloride	0.0005	0.001	0.002			U
Cis-1,2-Dichloroethylene		0.035	0.07			
Trans-1,2-Dichloroethylene	0.0005	0.0035	0.007			
1,1 Dichloroethylene		0.05	0.1			
1,1-Dichloroethane	0.0005	4.0		8.0		U
1,1 –Dichloropropene	0.0005					
1,2-Dibromo-3-chloroprop	0.001	0.000235		0.00047		
1,2-Dibromoethane	0.0005	0.00375		0.0000075		U
1,2-Dichloroethane	0.0005	0.0025	0.005			U
1,2-Dichloropropane	0.0005	0.0025	0.005			U
1,3-dichlorobenzene						U
1,3- dichloropropane	0.0005					
Cis-1,3-Dichloropropene	0.0005	0.0022		0.0044		U
Trans-1,3-Dichloropropene	0.0005	0.0022		0.0044		U
2,2-Dichloropropane	0.0005					
1,1,1,2-tetrachloroethane	0.0005	0.0025	0.005			U
1,1,1-trichloroethane		0.1	0.2			U
1,1,2 –Trichloroethane	0.0005	0.0025	0.005			U
1,1,2,2- Tetrachloroethane	0.0005	0.0025	0.005			U
1,2,3-Trichlorobenzene	0.0005					
1,2,3 –Trichloropropane	0.0005	0.0000265		0.000053		U
1,2,4-trichlorobenzene	0.0005	0.035	0.07			U
1,2,4- Trimethylbenzene	0.0005	0.06		0.120		U
1,3,5- Trimethylbenzene	0.0005	0.060		0.120		U
<b>Metals</b>						
Aluminum	0.00020	0.025 - 0.1	0.05 -0.2		2.048(1/18/95)	0.336
Antimony	0.007	0.003	0.006			U
Arsenic	0.004	0.005	0.01		0.00184(11/18/97)	U
Barium	0.01	1.0	2.0			U
Beryllium	0.002	0.002	0.004			U
Cadmium	0.005	0.0025	0.005			U
Chromium	0.01	0.05	0.1			U
Copper	0.02	0.65	1.3		0.0336(11/18/97)	U
Iron		0.15	0.30		6.379(4/16/96)	
Lead	0.003	0.0075	0.015		0.0141(6/12/98)	U
Manganese		0.025	0.05		0.2145(6/14/94)	
Mercury	0.0002	0.001	0.002		0.0004(3/15/94)	U
Nickel	0.040	0.05	0.1		0.040 U(6/19/95)	U
Selenium	0.005	0.025	0.05		0.005 U(6/19/95)	U
Silver	0.01	0.050	0.1		0.010 U(6/19/95)	U
Sodium						
Thallium	0.000005	0.001	0.002			U
Zinc	0.000020	2.5	5.0		0.155(3/15/94)	U
<b>Other Inorganics</b>						
Asbestos		3.5	7.0 MF/L			
Chloride	0.005	125	250		170(3/16/99))	37
Color						
Corrosivity						U

	Minimum detection level	50% of MCL or Screening Level	Treated Drinking Water MCL or Screening Level	Risk Based Screening Level	Maximum Recorded Level for Untreated Water	
Parameter	mg/L	mg/L	mg/L	mg/L	1990–2000	Aug 6/7, 2001
<b>Other Inorganics (con't)</b>						
Cyanide		0.1	0.2			0.22
Fluoride	0.0001	0.9	1.8			7.14
pH			6.5 – 8.5		5.3(1/30/96) - 8.3(7/15/97)	9.7
Sulfate	0.001	125	250			169
Total Dissolved Solids	0.01	250	500			
Turbidity (FTU)			See Regs			
Cesium 134			See Regs			
Gross Particle Activity		7.5	15 pci/l			
Iodine 131			See Regs			
Radon			Regs Pend.			
Radium 226 and 228		2.5	5 pci/l			
Strontium		4	8 pci/l			
Tritium		10,000	20,000 pci/l			

U = undetected at minimum detection level listed unless noted



## Appendix G

### Conversion Chart for Determining Susceptibility Based upon Vulnerability and Contaminant Potential

<b>Vulnerability + (Matrix Row)</b>	<b>Contaminant Potential = (Matrix Column)</b>	<b>Susceptibility</b>
<b>High Vulnerability</b>		
High +	High	Very High (6)
High +	Medium	High (5)
High +	Low	Moderate (4)
High +	Negligible	Low (3)
<b>Medium Vulnerability</b>		
Medium +	High	High (5)
Medium +	Medium	Moderate (4)
Medium +	Low	Low (3)
Medium +	Negligible	Very Low (2)
<b>Low Vulnerability</b>		
Low +	High	Moderate (4)
Low +	Medium	Low (3)
Low +	Low	Very Low (2)
Low +	Negligible	Not Susceptible (1)

Table prepared by Delaware DNREC, Fall 2001.

# Appendix H

## Acronyms and Definitions

### Acronyms

<b>AFO:</b>	Animal Feedlot Operation
<b>BMP:</b>	Best Management Practices
<b>CERCLA:</b>	Comprehensive Environmental Response, Compensation, and Liability Act
<b>CPWS:</b>	Community Public Water System
<b>CSO:</b>	Combined Sewer Overflow
<b>CTAC:</b>	Citizens and Technical Advisory Committee
<b>DGS:</b>	Delaware Geological Survey
<b>DHSS:</b>	Department of Health and Social Services
<b>DNREC:</b>	Department of Natural Resources and Environmental Control
<b>DPH:</b>	Division of Public Health
<b>DRWA:</b>	Delaware Rural Water Association
<b>DWR:</b>	Division of Water Resources
<b>DWSRF:</b>	Drinking Water State Revolving Fund
<b>GIS:</b>	Geographic Information System
<b>GPM:</b>	Gallons Per Minute
<b>GPS:</b>	Global Positioning System
<b>GWUDI:</b>	Ground Water Under the Direct Influence of Surface Water
<b>LUST:</b>	Leaking Underground Storage Tank
<b>MCL:</b>	Maximum Contaminant Level
<b>MGD:</b>	Million Gallons per Day
<b>NPDES:</b>	National Pollutant Discharge Elimination System
<b>NTNCPWS:</b>	Non-Transient Non-Community Public Water System
<b>PCB:</b>	Polychlorinated Biphenyls
<b>PMCL:</b>	Primary Maximum Contaminant Level
<b>PWS:</b>	Public Water System
<b>PWSS:</b>	Public Water Supply Supervision Program
<b>SARA:</b>	Superfund Amendments Reauthorization Act
<b>SDWA:</b>	Safe Drinking Water Act
<b>SIRB:</b>	Site Investigation and Restoration Branch



<b>SMCL:</b>	Secondary Maximum Contaminant Level
<b>SWAP:</b>	Source Water Assessment Plan
<b>SWAPP:</b>	Source Water Assessment and Protection Program
<b>TMDL:</b>	Total Maximum Daily Load
<b>TNCPWS:</b>	Transient Non-Community Public Water System
<b>UDWRA:</b>	Water Resources Agency at the University of Delaware
<b>USEPA:</b>	United States Environmental Protection Agency
<b>USGS:</b>	United States Geological Survey
<b>UST:</b>	Underground Storage Tank
<b>WHPP:</b>	Wellhead Protection Program
<b>WRPA:</b>	Water Resource Protection Area

### **Definitions**

**ANIMAL FEEDING OPERATION (AFO):** A lot or facility (other than an aquatic animal production facility) where animals have been, are, or will be stabled or confined and fed or maintained for a total of at least 45 days in any 12 month period, and the animal confinement areas do not sustain crops, vegetation, forage growth, or post-harvest residues in the normal growing season.

**ANIMAL UNIT:** A unit of measurement for any animal feeding operation calculated by adding the following numbers: the number of slaughter and feeder cattle multiplied by 1.0, plus the number of mature dairy cattle multiplied by 1.4, plus the number of swine weighing over 25 kg (55 lbs) multiplied by 0.4, plus the number of sheep multiplied by 0.1, plus the number of horses multiplied by 2.0.

**AQUIFER:** a water-bearing geological formation that will yield water to a well or spring. Aquifers can be classified as confined, semi-confined or unconfined.

**BASIN:** the surface area that drains into a surface water system.

**BACKGROUND LEVEL:** Generally, the amount of a substance that occurs naturally in the environment.

**BEST MANAGEMENT PRACTICES:** Structural, nonstructural and managerial techniques that are recognized to be the most effective and practical means to control non-point source pollutants yet are compatible with the productive use of the resource to which they are applied. These are used in both urban and agricultural areas.

**CHLORINATION:** A method of disinfecting water using chlorine gas or chlorine-based chemicals (either drinking water or wastewater).

**COMBINED SEWER OVERFLOW:** Flow of wastewater and runoff in a combined sewer in excess of the sewer capacity. It represents the flow that cannot be treated immediately and is frequently discharged directly to a receiving stream without treatment, or to a holding basin for subsequent treatment and disposal.

**COMMUNITY PUBLIC WATER SUPPLY:** A public water supply which serves at least fifteen (15) service connections used by year round residents or regularly serves at least twenty-five (25) year round residents.

**CONCENTRATED ANIMAL FEEDING OPERATION (CAFO):** An animal feeding operation that meets the criteria in 40 CFR Part 122, Appendix B (as follows):

- 1) A lot or facility that stables or confines and feeds or maintains for a total of 45 days or more in a 12 month period more than the number of animals equivalent to 1000 animal units.
- 2) A lot or facility that discharges pollutants into the waters of the U.S. either through a man made ditch or system; or directly into waters of the U.S. which originate outside of and pass over, across, or through the facility or otherwise come into direct contact with the animals confined in the operation and that stable or confines and feeds or maintains for a total of 45 days or more in a 12 month period more than the number of animals equivalent to 300 animal units.

**CONFINED AQUIFER:** An aquifer bounded above and below by impermeable beds (such as silt or clay) or beds of distinctly lower permeability than that of the aquifer itself and containing ground water which is everywhere at a pressure greater than atmospheric and from which water in a well will rise to a level above the top of the aquifer.

**CONTAMINANT:** Any substance, either man-made or natural which is concentrated enough to degrade water quality to a degree that renders such water harmful to public health and safety, or to the environment.

**CONTAMINANT SOURCE INVENTORY:** A list of possible contaminant sources within the delineated source water assessment areas. The inventory process includes: reviewing existing data on the locations of potential contaminant sources, identifying likely sources for further information, and verifying the accuracy and reliability of data sets.

**DELINEATION:** The process of defining and/or mapping a boundary that approximates the areas that contribute water to a particular water source used as a public water supply.

**DISCRETE (POINT) SOURCE:** An existing or potential source of pollution to surface or ground-water supplies at well defined, usually manufactured, points or locations

**DOMESTIC WELL:** A well primarily used for potable non-public water supply purposes which serves 3 or fewer dwelling units.

**DREDGE SPOILS:** Areas where sediment, which has been excavated from a lake, pond, or river channel, is stored.

**EFFECTIVE POROSITY:** The volume of void spaces through which water or other fluids can travel in a rock or sediment divided by the total volume of the rock or sediment.

**EROSION:** Wearing away of soil by running water, wind, or ice; erosion is the process by which the earth's surface is shaped and occurs even in remote, uninhabited areas at a slow rate (geologic erosion); of more concern is accelerated erosion caused by people's activities.

**EROSION-PRONE SLOPE:** These are areas consisting of lands with soils that are easily eroded.



**GROUND WATER:** Any water naturally found under the surface of the earth.

**GROUND WATER UNDER THE DIRECT INFLUENCE AT SURFACE WATER (GWUDI):**

Any water beneath the surface of the ground with (i) significant occurrence of insects or other macro-organisms, algae, or large diameter pathogens such as *Cryptosporidium* or *Giardia lamblia* or (ii) significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH which closely correlates to climatological or surface water conditions.

**HAZARDOUS WASTE:** Any waste material that is potentially dangerous, including explosives, radioactive materials, and chemicals.

**HAZARDOUS WASTE GENERATOR:** Any person, by site, whose act or process produces hazardous waste as identified in the Delaware Regulations Governing Hazardous Waste, or whose act first causes a hazardous waste to become subject to regulation.

**HYDRAULIC GRADIENT:** The gravity or pressure gradient which controls the lateral flow of ground water through an aquifer..

**INFILTRATION:** The entry of water (from precipitation, irrigation, and snowmelt) into the soil profile. Also referred to as Recharge.

**INFILTRATION RATE:** The rate at which water applied to the surface of the ground can enter the soil.

**LANDFILL:** A natural topographic depression and/or man made excavation and/or diked area, formed primarily of earthen materials, which has been lined with man-made and/or natural materials or remains unlined and which is designed to hold an accumulation of solid wastes.

**LARGE ON-SITE SEPTIC SYSTEM:** Any existing or proposed on-site sewage disposal system, designed to handle a projected daily flow of greater than 2,500 gallons, installed or proposed to be installed on land of the owner of the system or on other land as to which the owner of the system has the legal right to install the system.

**LEAKING UNDERGROUND STORAGE TANK (LUST):** A container, as defined in the Delaware Regulations Governing Underground Storage Tank Systems, that is leaking or which has leaked a hazardous substance into subsurface soils and/or groundwater.

**MAXIMUM CONTAMINANT LEVEL (MCL):** The maximum permissible level of a contaminant in water which is delivered to any user of a public water system.

**NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES):** The national program for issuing, modifying, revoking and reissuing, terminating, monitoring, and enforcing permits for the discharge of any pollutant or combination of pollutants and imposing and enforcing pretreatment and sludge requirements as stated in the Delaware Regulations Governing the Control of Water Pollution.

**NON-TRANSIENT NON-COMMUNITY WATER SYSTEM:** A public water system that is not a community water system and that regularly serves at least twenty-five (25) of the same persons over six (6) months per year.

**NON-COMMUNITY PUBLIC WATER SUPPLY:** A public water supply which has at least fifteen (15) service connections or regularly serves an average of at least twenty-five (25) individuals daily at least sixty (60) days out of the year. Also referred to as a Transient Non-Community Public Water Supply.

**NONPOINT SOURCE POLLUTION:** Pollution of surface or ground water supplies originating from land use activities and/or the atmosphere, having no well-defined point of entry.

**PERCOLATION:** Downward movement of water through the unsaturated soil profile or rock units to the water table.

**PERCOLATION RATE:** The rate at which water moves through unsaturated granular material or rock toward the water table.

**PESTICIDE LOADING, MIXING, AND STORAGE FACILITY:** A facility or site where significant quantities of primarily agricultural pesticides may be: stored for future application, mixed prior application, and/or loaded for transport to the site of application.

**POINT SOURCE POLLUTION:** Pollution of surface or ground water supplies at well defined, usually manufactured "points" or locations; discharges of treated wastewater from municipal and industrial treatment plants are common point sources of pollution.

**PRIMARY MAXIMUM CONTAMINANT LEVEL (PMCL):** A MCL which involves a biological, chemical, or physical characteristic of drinking water that may adversely affect the health of the consumer.

**PUBLIC DRINKING WATER SYSTEM:** A community, non-community, or non-transient non-community water system, which provides piped water to the public for human consumption. The system must have at least 5 service connections or regularly serve at least 25 individuals daily for at least 60 days.

**RECHARGE AREA:** Land area over which precipitation infiltrates into the soil and percolates downward to replenish an aquifer

**SALINITY:** The quality of water based on its salt content; salinity is usually expressed in parts per thousand [seawater is typically 18 parts per thousand].

**SALVAGE YARDS:** Areas where damaged, non-working automobiles and/or machinery are stored for recovery of usable parts.

**SATURATED THICKNESS:** The thickness of an aquifer that is fully filled with water.

**SECONDARY MAXIMUM CONTAMINANT LEVEL (SMCL):** A MCL which involves a biological, chemical, or physical characteristic of water that may adversely affect the taste, odor, color, or appearance (aesthetics), which may thereby affect public confidence or acceptance of the drinking water.

**SEMI-CONFINED AQUIFER:** An aquifer that is overlain by a layer of sufficiently less permeability (such as very fine sand) than the aquifer itself but through which significant amounts of water can pass into the aquifer.



**SEPTIC SYSTEM:** An onsite system designed to treat and dispose of domestic sewage; a typical sewage system consists of a tank that receives wastes from a residence or business and a system of tile lines or a pit for disposal of the liquid effluent remains after decomposition of the solids by bacteria in the tank.

**SITE INDEX DATABASE:** The DNREC database, developed for whole basin assessments, that is used to characterize the relative environmental release potential of a discrete potential source of contamination.

**SOURCE WATER:** Any aquifer or surface water body from which water is taken either periodically or continuously by a public water system for drinking or food processing purposes.

**SOURCE WATER ASSESSMENT AREA:** The delineated area that contributes water to a public water supply system. This is called a wellhead protection area for a well and a watershed or basin for a surface water intake.

**SUPERFUND SITE:** a site where there is believed to have been a release of a hazardous substance into the environment that requires investigation and cleanup under the jurisdiction of the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Delaware Hazardous Substance Cleanup Act (HSCA), Voluntary Cleanup Program (VCP), or the Brownfield Assessment Program.

**SUSCEPTIBILITY:** The relative likelihood that a public water supply might draw water contaminated at concentrations at levels of concern to public health.

**SUSCEPTIBILITY DETERMINATION:** An evaluation of conditions in the source water assessment area to determine the potential for contaminants to impact public drinking water quality.

**SURFACE WATER:** Lakes, ponds, streams, rivers, and other water bodies, which lie on the land surface.

**TOXICS RELEASE INVENTORY (TRI):** The Toxics Release Inventory is a publicly available database containing information reported annually for certain toxic chemicals that are manufactured, processed, or otherwise used by certain facilities in Delaware and throughout the United States.

**TRANSMISSIVITY:** The rate at which water is transmitted through a unit width of an aquifer under a unit hydraulic gradient.

**UNCONFINED AQUIFER:** An aquifer in which no relatively impermeable layer exists between the water table and the ground surface and an aquifer in which the water surface is at atmospheric pressure.

**UNDERGROUND STORAGE TANK (UST):** Any one or combination of tanks including underground pipes connected thereto, which is used to contain an accumulation of regulated substances, and the volume of which, including the volume of underground pipes connected thereto, is 10 percent or more beneath the surface of the ground as further defined in the Delaware Regulations Governing Underground Storage Tank Systems.

**UNREGULATED CONTAMINANT:** A contaminant that currently does not have a drinking water standard but is being considered, by the state or EPA, for possible regulation.

**UNSATURATED ZONE:** Partially saturated soil and rock units above the water table.

**VULNERABILITY:** The relative ease with which contaminants, if released into a source water area, could move and enter a public water supply well or intake at concentrations of concern. Vulnerability includes consideration of such factors as aquifer characteristics, well or surface water intake integrity, and well screen depth.

**WASTE SLUDGE APPLICATION FACILITY:** A facility which applies stabilized sewage sludge or industrial sludge to the surface of agricultural or forested lands for the purpose of assimilation and protection of the environment. As the sludge decomposes, the constituents are taken up by plants, fixed in relatively insoluble forms in the soil, evolve as gases, or migrate with water movement.

**WASTEWATER SPRAY IRRIGATION FACILITY:** A facility that applies wastewater consisting of domestic, industrial, and/or animal wastes to the land surface. Water does not directly discharge into surface bodies but filters through the subsurface, depositing organic constituents to the soil, or evaporates to the atmosphere.

**WATERSHED:** An area of land bounded by drainage divides which contributes runoff to one specific delivery point in a stream network; large watersheds may be composed of several smaller “sub-watersheds”, each of which contributes runoff to different locations that ultimately combine at a common delivery point.

**WATER TABLE:** The upper boundary of the saturated zone of an unconfined aquifer.

**WELLHEAD PROTECTION AREA:** the surface and subsurface area surrounding a water well or wellfield supplying a public water system through which contaminants are likely to move toward and reach such well or wellfield.



## Public Water Supplier Service Areas in Northern New Castle County

